2008
LOUISIANA WATER QUALITY INVENTORY: INTEGRATED REPORT

FULFILLING REQUIREMENTS OF THE FEDERAL CLEAN WATER ACT, SECTIONS 305(b) AND 303(d)

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PART I: EXECUTIVE SUMMARY/OVERVIEW

Summary of Louisiana's Water Quality Assessment Program

Louisiana, well known for its abundance of water resources, contains over 66,294 miles of rivers and streams, 1,078,031 acres (1,684 square miles) of lakes and reservoirs, 5,550,951 acres (8,673 square miles) of fresh and tidal wetlands, and 4,899,840 acres (7,656 square miles) of estuaries. These figures, some of which are taken from the U.S. Environmental Protection Agency's (USEPA) River Reach 3 file, are believed to be low in comparison to the actual total area of Louisiana's rivers, lakes, wetlands, and estuaries. It is the responsibility of the Louisiana Department of Environmental Quality (LDEQ) to protect the chemical, physical, biological, and aesthetic integrity of the water resources and aquatic environment of Louisiana. This responsibility is undertaken through the use of public education, scientific endeavors, water quality management, and regulatory enforcement, in order to provide the citizens of Louisiana with clean and healthy water now and in the future.

The *2008 Integrated Report* documents LDEQ's progress toward meeting this responsibility. Louisiana's *Integrated Report* is produced, in part, to meet requirements of the Federal Water Pollution Control Act commonly known as the Clean Water Act (CWA) (CWA, 1972). The primary CWA sections addressed by the *2008 Integrated Report* are §303(d) and §305(b). Section 303(d) requires states to list impaired water bodies and to develop a Total Maximum Daily Load (TMDL) for those water bodies. Section 305(b) of the CWA requires each state to provide the following information to the Administrator of the USEPA:

1. A description of the water quality of all navigable waters in the state;
2. An assessment of the status of waters of the state with regard to their support of recreational activities and fish and wildlife propagation;
3. An assessment of the state's water pollution control activities toward achieving the CWA goal of having water bodies that support recreational activities and fish and wildlife propagation;
4. An estimate of the costs and benefits of implementing the CWA; and
5. A description of the nature and extent of nonpoint sources of pollution and recommendations for programs to address nonpoint source pollution.

For the *2008 Integrated Report*, LDEQ used USEPA's *Consolidated Assessment and Listing Methodology* (USEPA, 2002), which contains the Integrated Report (IR) guidance, as well USEPA's guidance document, *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act* (USEPA, 2005). In addition to the previous two documents, USEPA issued updates to the Integrated Report guidance in the form of a memorandum. Louisiana's water quality regulations (Louisiana Administrative Code (LAC) 33:IX.1101 et seq. (LAC, 2008) were used to determine water quality uses and criteria and, in some cases, assessment procedures. One of the primary focuses of USEPA's IR guidance is on the use of seven categories to which water bodies or water body/impairment combinations may be assigned. Categorization under IR guidance allows for a more focused approach to water quality management by clearly determining which actions are required to protect or improve individual waters of the state. The seven IR categories can be found in table 1.1.1.

Summary of Overall Water Quality in Louisiana

As shown in figure 1.1.1, Louisiana's water quality continued its gradual improvement between 2006 and 2008 in two important areas. For 2008 an additional 25 water bodies were assessed as fully supporting their designated use of primary contact recreation (PCR) or swimming. Six additional water bodies were found to be fully supporting their designated use of secondary contact recreation (SCR) or boating. This means that approximately 83% of Louisiana's assessed water bodies were meeting PCR water quality criteria for fecal coliforms. Approximately 97% were meeting the SCR criteria, which is less stringent than the criteria for PCR. While some of these improvements could be attributed to improved ambient monitoring and assessment, much of the credit also goes to extensive efforts to reduce the release of sewage from municipal sewage treatment plants, home sewage systems and agriculture.

Table 1.1.1.

U.S. Environmental Protection Agency Integrated Report Methodology guidance categories used to categorize water body/pollutant combinations for the *Louisiana 2006 Integrated Report*

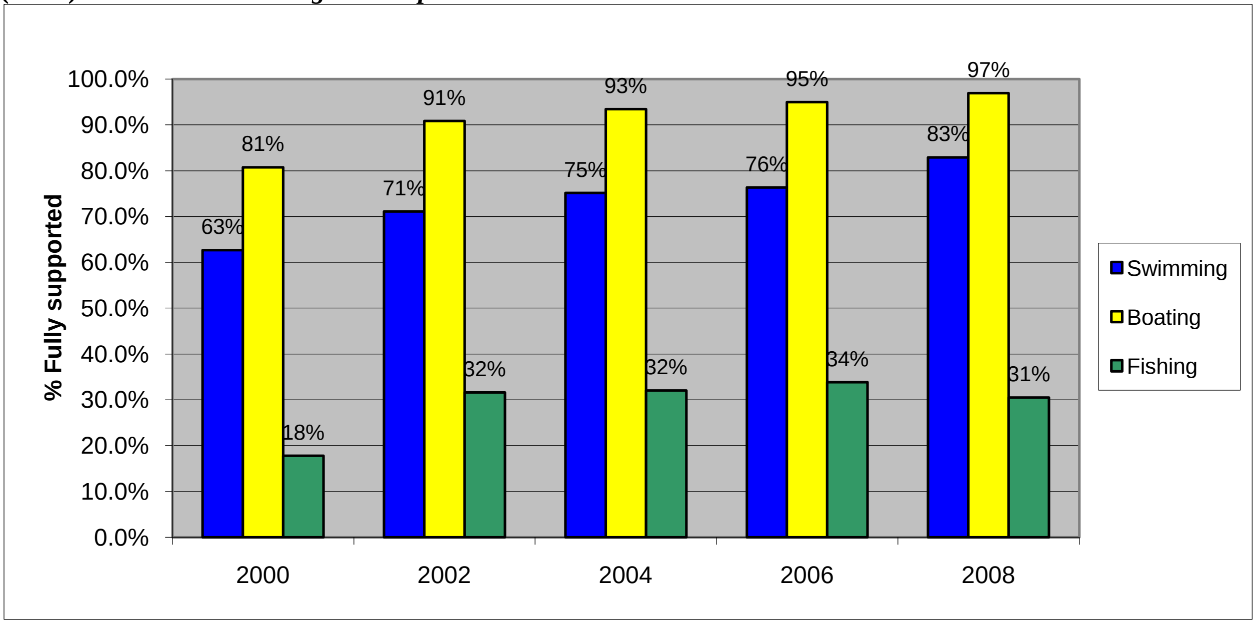
IR Category (IRC)	IR Category Description
IRC 1	Specific Water body Impairment Combination (WIC) cited on a *previous* §303(d) list is now attaining all uses and standards. Also used for water bodies that are fully supporting all designated uses.
IRC 2	Water body is meeting some uses and standards but there is insufficient data to determine if uses and standards associated with the specific WIC cited are being attained.
IRC 3	There is insufficient data to determine if uses and standards *associated with the specific WIC* cited are being attained.
IRC 4a	WIC exists but a TMDL has been completed for the *specific WIC* cited.
IRC 4b	WIC exists but control measures other than a TMDL are expected to result in attainment of designated uses *associated with the specific WIC* cited.
IRC 4c	WIC exists but a pollutant (anthropogenic source) does not cause the *specific WIC* cited.
IRC 5	WIC exists for one or more uses, and a TMDL is required for the *specific W*IC cited. **IRC 5 and its subcategories represents Louisiana's §303(d) list.**
IRC 5RC (Revise Criteria)	WIC exists for one or more uses, and a TMDL is required for the specific WIC cited; however, LDEQ will investigate revising criteria due to the possibility that natural conditions may be the source of the water quality criteria impairments.

Support of the third significant designated use, fish and wildlife propagation (FWP), declined slightly from 34% to 31%; however, this reduction was due primarily to a change in water quality assessment procedure agreed upon between LDEQ and USEPA. For 2008 LDEQ reverted to the commonly used "10% rule," whereby no more than 10% of ambient samples can fall below the criteria for dissolved oxygen during a given monitoring and assessment period. Previously, LDEQ used an assessment method that took into account the natural fluctuations and typically low dissolved oxygen concentrations found in Louisiana's sluggish bayous, lakes and wetlands. In addition to reverting to the 10% rule LDEQ, in conjunction with USEPA, developed a continuous monitoring assessment process. Under this procedure, if a water body was found to be not meeting its dissolved oxygen criteria based on monthly instantaneous samples, LDEQ regional staff deployed specialized meters that continuously measure the oxygen level in the water over a 48-72 hour period. These continuous monitor readings over time allowed LDEQ to determine what percentage of time the dissolved oxygen level fell below the acceptable criteria over the course of the sampling period. If the continuous monitoring indicated the dissolved oxygen remained above the criteria 90% of the time then the water body was considered fully supported. The use of continuous monitoring for dissolved oxygen represents a substantial improvement over conventional monthly instantaneous sampling for dissolved oxygen. However, continuous monitoring is much more costly and time consuming than conventional sampling; therefore, it can only be used as a follow-up to the conventional monthly samples.

Many of Louisiana's water bodies remain impaired for the designated use of FWP. This is largely because there are many possible causes and sources of impairment impacting this use. As shown in table 1.1.2, there were 33 different suspected causes of impairment reported as impacting FWP. Any one of these causes can result in a water body being considered impaired for FWP. In order to break this down further, consider the impact of nonpoint versus point source water pollution. Nonpoint Source (NPS) pollution consists of those forms of pollution caused by the runoff of stormwater from land such as agricultural fields, forestry areas, construction sites, and urban areas to name a few. In contrast, Point Sources (PS) of water pollution are those which derive from a discrete pipe such as a small or large industrial discharger or municipal sewage treatment plant. With this distinction in mind, the vast majority of water body impacts are due to NPS with 298 reported impacts due almost exclusively to NPS or natural conditions. Impacts possibly related to either NPS or PS accounted for 353 suspected causes of impairment, while only 33 reported impacts related almost exclusively to PS, specifically industrial inputs. Many of these suspected industrial causes are believed to be legacy pollutants which have been or are in the process of being remediated. An additional 163 impacts were reported due to what were suspected to be natural conditions and 43 impacts were related to aquatic invasive species.

Figure 1.1.1.

Comparison of the percentage of water body subsegments in Louisiana fully supporting the designated uses of primary contact recreation (PCR), secondary contact recreation (SCR), and fish and wildlife propagation (FWP). ***2008 Louisiana Integrated Report*.**



The large number of impairments related to mercury in table 1.1.2 are due to the presence of 48 fish consumption advisories. Each advisory applies to one or more distinct water bodies in a region. Because the sources of mercury are to a large extent related to atmospheric deposition, they are national or even international in scope. Therefore, USEPA has taken the lead in developing ways to address mercury releases to the environment. LDEQ is participating in this effort and has an extensive fish tissue monitoring program to identify areas where mercury is a concern. LDEQ has also developed a Mercury Initiative designed to reduce or eliminate the use and release of mercury to the environment within Louisiana. In addition to the mercury-related advisories, eight fish consumption advisories are due to the presence of organic chemicals. All but one of these organic chemical advisories are the result of past industrial practices or spills. As such, they have been or are being addressed through water quality permits, enforcement actions, remediation activities, or a combination of these. The remaining organic chemical-related advisory, on the Tensas River, is due to DDT and Toxaphene. DDT was banned in 1972 while Toxaphene was canceled for most uses in 1982 and banned for all uses in 1990. However, legacy contamination continues to be present in some of the soils and sediments of the region. It is anticipated that over time additional fish tissue testing will indicate that fish consumption advisories can be lifted on these water bodies.

It is apparent there are a large number of issues facing Louisiana's fish and wildlife propagation use. LDEQ has numerous programs in place to address these problems. Programs include permitting of industry, small businesses, and municipalities; enforcement and remediation actions to identify and correct problems when they occur; and the development and implementation of best management practices to address nonpoint sources of pollution. More information on Louisiana's water pollution control efforts can be found in Part II, Chapter 2. More information on the suspected causes and sources of water pollution in Louisiana can be found in Part III, Chapters 3-6.

Table 1.1.2.

Number of water body subsegments, with the designated use of fish and wildlife propagation, impacted by each suspected cause of impairment. *2008 Louisiana Integrated Report*.

Suspected Causes of Impairment	**River**	**Lake**	**Estuary**	**Wetland**	**Total**
1,1,1,2-Tetrachloroethane	1				1
1,2-Dichloroethane	1				1
Ammonia (Total)	5	1	1		7
Arsenic		1			1
Atrazine	1				1
Bromoform	1				1
Carbofuran	23	1	1		25
Chloride	25	1		1	27
DDT	6				6
Dioxin (including 2,3,7,8-TCDD)	1				1
Fipronil	6				6
Hexachlorobenzene	1	1			2
Hexachlorobutadiene	1	1			2
Lead	12	2			14
Mercury in Fish Tissue	73	20	9	1	103
Methoxychlor	1				1
Methyl Parathion	1				1
Nitrate/Nitrite (Nitrite + Nitrate as N)	52	9	2		63
Non-Native Aquatic Plants	26	16	1		43
Oil and Grease	1	1			2
Oxygen, Dissolved	175	33	9	2	219
pH, High	1	5			6
pH, Low	23	5			28
Phenols	1				1
Phosphorus (Total)	50	9	2		61
Polychlorinated biphenyls	3	3			6
Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems)	2				2
Sedimentation/Siltation	29	4	2		35
Sulfates	33	3		1	37
Total Dissolved Solids	59	3		1	63
Total Suspended Solids (TSS)	41	6	2		49
Toxaphene	2				2
Turbidity	52	15	3		70
Grand Total	**709**	**140**	**32**	**6**	**887**

Summary of Suspected Causes of Impairment to Water Quality

Thirty-eight different suspected causes of impairment to all designated uses were identified for the 2008 IR. Details of the ambient water quality data assessment methods can be found in Part III, Chapter 2. In order to provide a broad picture of water quality impairments in Louisiana, these thirty-eight different suspected causes were assigned to the nine categories identified in table 1.1.3. Of these nine categories, dissolved oxygen/nutrients, sediment, water chemistry constituents, mercury, nonpoint source sewage, and agricultural chemicals are all related in whole or in part to nonpoint sources of pollution.

From this analysis it is apparent that NPS pollution is responsible for well over half of the water quality impairments in Louisiana. This is not surprising considering the extensive nature of agriculture and forestry in the state, as well as the contributions made by road and building construction projects. Stormwater runoff from cities, towns, and suburban areas also contributes significantly to NPS pollution. By contrast suspected causes of impairment likely to be associated with industrial pollution were identified only 38 times among the 1,013 reported suspected causes. A more extensive discussion of the sources of impairment to Louisiana's waters can be found in the following section. A complete listing of the suspected causes for each water body type (river, lake, estuary, wetland) can be found in Part III, Chapters 3-6.

Table 1.1.3.

Categorical listing of suspected causes of water quality impairment in Louisiana. *2008 Louisiana Integrated Report.*

Suspected Cause Category	**Number of Citations for each Category**
Dissolved Oxygen/Nutrients	353
Sediment	170
Water Chemistry Minerals or Characteristics	127
Mercury (Primarily atmospheric deposition)	103
Nonpoint and Point Source Sewage	87
Natural	47
Invasive Species	43
Agricultural Chemicals	42
Industrial Chemicals	38
Total Identified Suspected Causes	**1010**

Summary of Suspected Sources of Impairment to Water Quality

For each suspected cause of impairment, one or more suspected sources were identified by regional staff. When determining the origins of water body impairments, a total of 66 different suspected sources were reported. In an attempt to summarize these diverse suspected sources, broad groupings or classifications were developed as shown in table 1.1.4. From these, the total number of occurrences for each group was determined. The totals provided do not represent the number of subsegments or water bodies impacted by each group; rather, they represent the total number of times the suspected sources in that group or class were reported. This gives a good indication of the predominant forms of water pollution needing to be addressed in Louisiana. A complete listing of suspected sources for each water body type can be found in Part III, Chapters 3-6.

Based on this analysis, and excluding mercury sources and natural conditions, it is apparent that the majority of water quality impairments in Louisiana are the result of improperly treated sewage and agriculture, with 194 and 141 occurrences of these two categories, respectively. Sewage discharges may come from large municipal sewage treatment systems but more often result from home sewage treatment systems and small community or neighborhood systems. Other sources of bacteria and nutrients include agricultural pasture areas, dairy farms, or concentrated animal feeding areas.

Table 1.1.4.

Categorical listing of suspected sources of water quality impairment in Louisiana. *2008 Louisiana Integrated Report.*

Suspected Source Categories	Number of Citations for each Category
Sources of Mercury[1]	283
Natural Conditions[2]	209
Sewage	194
Agriculture	138
Hydrology and Wetland Alteration	69
Urban/Rural	55
Invasive Species	45
Industrial	33
Forestry	24
Upstream Sources	14
Total Identified Suspected Sources	**1064**

[1] This category consists of atmospheric deposition and source unknown. The former is assigned only to mercury impairments resulting from fish tissue advisories due to mercury. The latter is predominantly assigned to mercury advisory waters but may be assigned to other suspected causes of impairment as well.
[2]This category consists of those criteria exceedances believed to be caused in whole or part by natural conditions.

Louisiana is of course an agricultural state, so it is not surprising to find that a large percentage of water quality impairments are the result of farming practices. Most impairments resulting from agriculture take the form of excess nutrients, which may result in reduced dissolved oxygen levels in the water caused by stimulating algal growth. Excess sedimentation from field erosion is also a frequent problem associated with agriculture. Taken together these sources of water quality impairment are known as nonpoint source pollution, which was described above. The LDEQ Nonpoint Source Program has more information regarding nonpoint source pollution and Louisiana's efforts to control it. Part II, Chapter 2 of this report also contains an update on these efforts.

Wetland alteration as a source of impairment was predominantly reported in Louisiana's endangered coastal regions where coastal erosion and wetland loss are severe. This leads to a variety of water quality and land use problems that are well documented elsewhere. The Louisiana Department of Natural Resources, Office of Coastal Restoration and Management has an extensive Web site covering the Louisiana coastal area.

While the problem of invasive species in Louisiana is nothing new, climate change and new introductions could accelerate their proliferation and broaden their ranges. Water hyacinth (*Eichhoria crassipes*) was introduced to the United States from South America at the World's Industrial and Cotton Centennial Exposition of 1884-1885 in Louisiana. It is now found throughout much of Louisiana and the southern United States, where it can form dense surface mats that choke out native vegetation. Hydrilla (*Hydrilla verticillata*), another older introduction which came from Europe and Asia via the aquarium trade, forms dense underwater growth. This growth can completely destroy native vegetation over large areas and foul boat propellers, making it impossible to navigate affected waters. To these older invasive species can now be added giant salvinia (*Salvinia molesta*). Like water hyacinth, this invasive is capable of completely dominating the surface of water bodies, potentially forming mats up to two feet thick where wind or wave action has piled it up. It reproduces rapidly and can quickly propagate from just a small amount of the plant transferred to new water bodies on boats and trailers. For more information on aquatic invasive species please refer to the Louisiana Aquatic Invasive Species Council Web Site or contact the Louisiana Department of Wildlife and Fisheries.

The remaining categories of suspected sources, urban/rural, industrial, and forestry, play smaller but still important roles in causing water quality impairment. Due to their smaller areal extent, these effects tend to be more localized.

However, where they occur they can cause extensive water quality problems, especially in highly urbanized or suburban watersheds. Urban/rural impacts are another form of NPS water pollution. Forestry, a major contributor to Louisiana's agricultural industry, is very extensive in portions of the state. Louisiana's forestlands cover 48% of the state or 13.8 million acres (LDAF, 2008). It is also yet another category of NPS pollution. However, forestry has a less severe effect on water quality due to its nature of operation and the use of effective best management practices to control water pollution. Interestingly, industrial impacts to water quality are a smaller concern in Louisiana due to the highly regulated nature of the state's petrochemical and other industries.

Summary of River Quality in Louisiana

Figures 1.1.2 through 1.1.4 summarize support of the three most common designated uses for Louisiana rivers. The uses are primary contact recreation (PCR) (swimming), secondary contact recreation (SCR) (boating, fishing), and fish and wildlife propagation (FWP). Other uses are established for selected water bodies in Louisiana. The status of these uses can be found in Part III, Chapter 3. Summary tables for the suspected causes and sources of impairment to Louisiana's rivers can also be found in Part III, Chapter 3. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

Figure 1.1.2.

Support for primary contact recreation (swimming) for Louisiana rivers, 2008 Integrated Report. (Based on 332 assessed rivers)

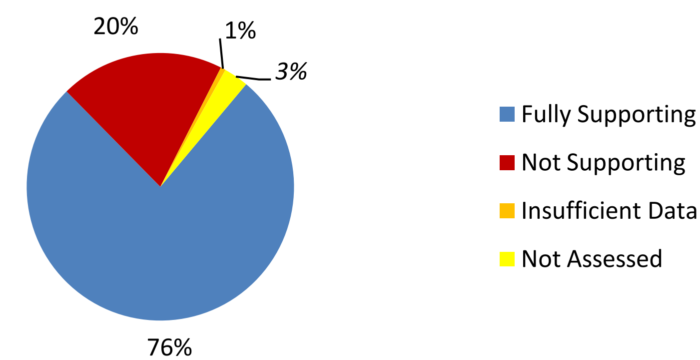


Figure 1.1.3.

Support for secondary contact recreation (boating) for Louisiana rivers, 2008 Integrated Report. (Based on 344 assessed rivers.)

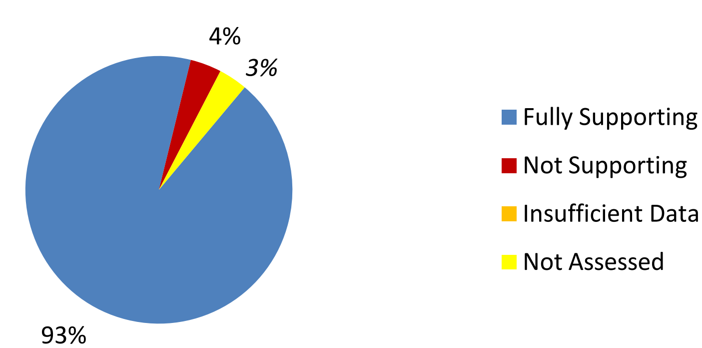
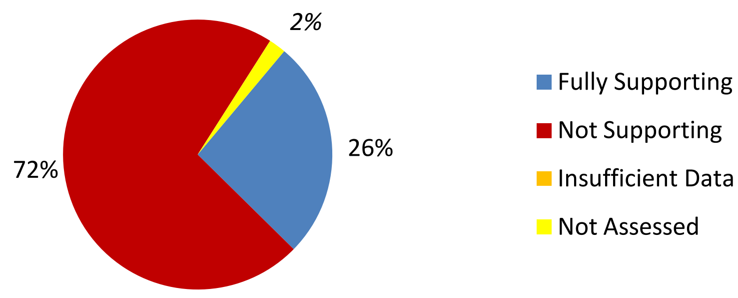


Figure 1.1.4.

Support for fish and wildlife propagation (fishing) for Louisiana rivers, 2008 Integrated Report. (Based on 339 assessed rivers)



Summary of Lake Quality in Louisiana

Figures 1.1.5 through 1.1.7 summarize support of PCR, SCR, and FWP in Louisiana lakes. Other uses are established for selected water bodies in Louisiana. The status of these other uses can be found in Part III, Chapter 4. Summary tables for the suspected causes and sources of impairment to Louisiana's lakes can also be found in Part III, Chapter 4. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

Figure 1.1.5.
Support for primary contact recreation (swimming) for Louisiana lakes, 2008 Integrated Report. (Based on 66 assessed lakes)

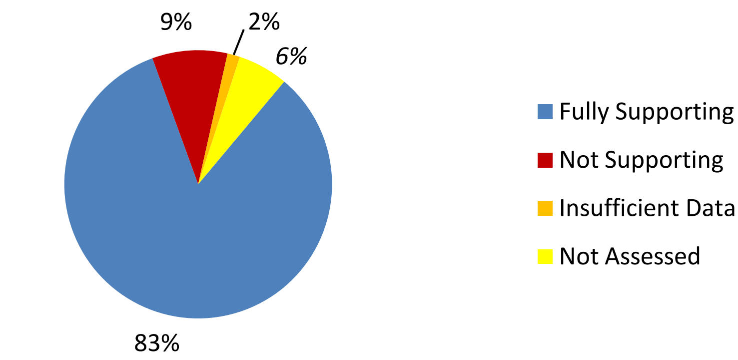


Figure 1.1.6.

Support for secondary contact recreation (boating) for Louisiana lakes, 2008 Integrated Report. (Based on 66 assessed lakes)

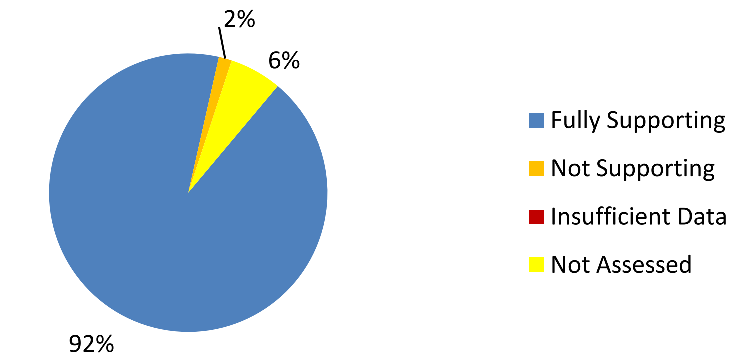
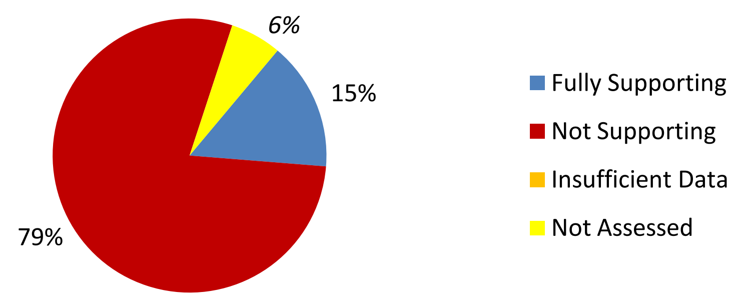


Figure 1.1.7.

Support for fish and wildlife propagation (fishing) for Louisiana lakes, 2008 Integrated Report. (Based on 66 assessed lakes)



Summary of Estuary Quality in Louisiana

Figures 1.1.8 through 1.1.10 summarize support of PCR, SCR, and FWP for Louisiana estuaries. Other uses are established for selected water bodies in Louisiana. The status of these uses can be found in Part III, Chapter 5. Summary tables for the suspected causes and sources of impairment to Louisiana's estuaries can also be found in Part III, Chapter 5. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

Figure 1.1.8.

Support for primary contact recreation (swimming) for Louisiana estuaries, 2008 Integrated Report. (Based on 52 assessed estuaries)

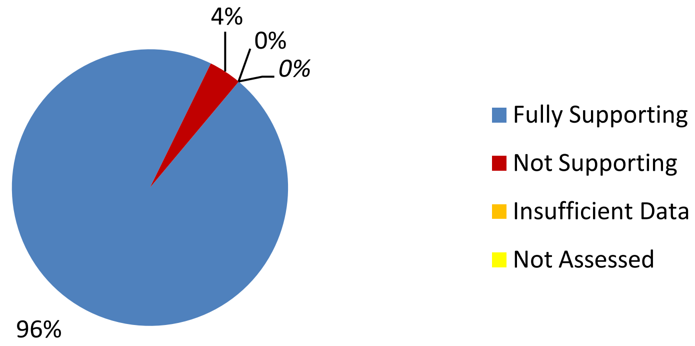


Figure 1.1.9.

Support for secondary contact recreation (boating) for Louisiana estuaries, 2008 Integrated Report. (Based on 52 assessed estuaries)

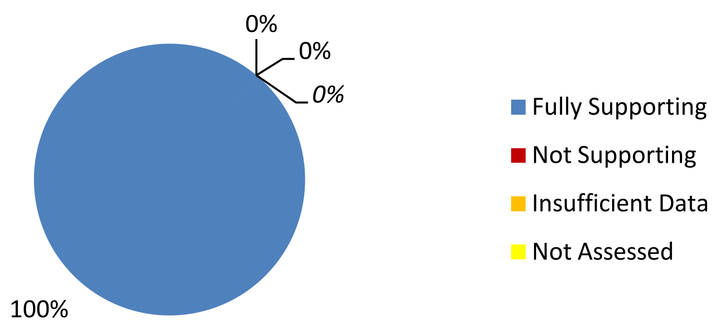
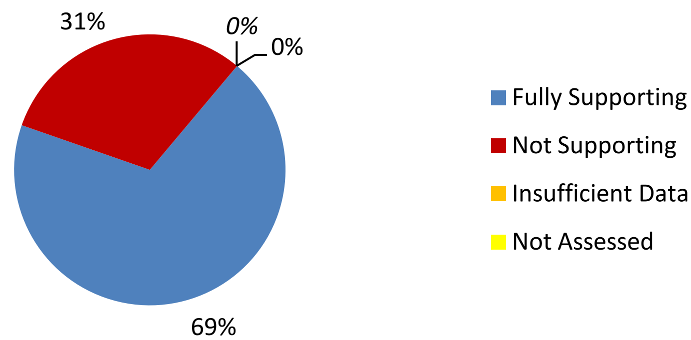


Figure 1.1.10.

Support for fish and wildlife propagation (fishing) for Louisiana estuaries, 2008 Integrated Report. (Based on 52 assessed estuaries)



Summary of Wetland Quality in Louisiana

Figures 1.1.11 through 1.1.13 summarize support of PCR, SCR, and FWP in Louisiana wetlands. Other uses are established for selected water bodies in Louisiana. The status of these uses can be found in Part III, Chapter 6. Summary tables for the suspected causes and sources of impairment to Louisiana's wetlands can also be found in Part III, Chapter 6. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

Figure 1.1.11.

Support for primary contact recreation (swimming) for Louisiana wetlands, 2008 Integrated Report. (Based on 6 assessed wetlands)

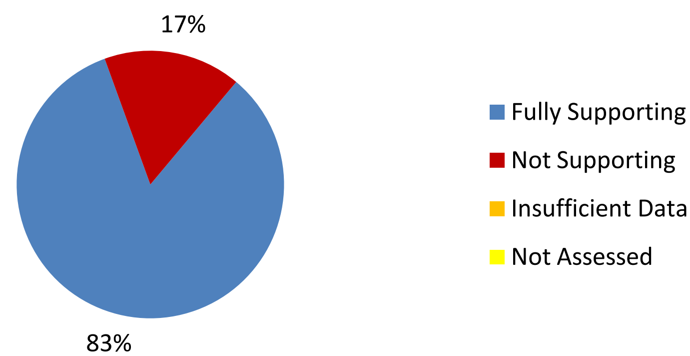


Figure 1.1.12.
Support for secondary contact recreation (boating) for Louisiana wetlands, 2008 Integrated Report. (Based on 16 assessed wetlands)

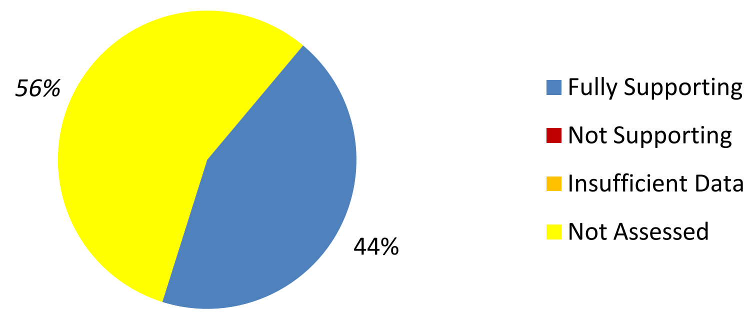
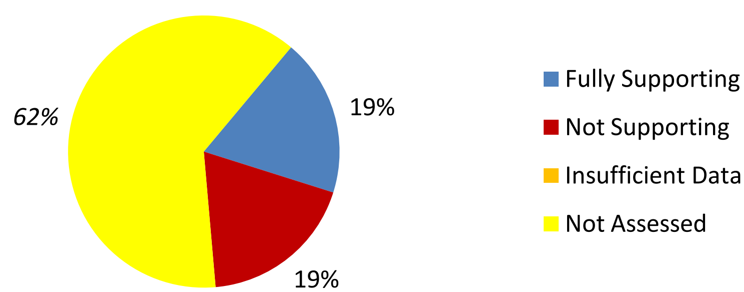


Figure 1.1.13.

Support for fish and wildlife propagation (fishing) for Louisiana wetlands, 2008 Integrated Report. (Based on 16 assessed wetlands)



Ground Water Quality in Louisiana

The Water Quality Assessment Division's Baseline Monitoring Program (BMP) provides water quality data from fresh water aquifers around the state. Wells producing from a common aquifer are sampled in a narrow time frame. The smaller aquifers can be sampled in one or two days, whereas, the larger aquifers may take several months to complete. When all assigned wells of a particular aquifer have been sampled a summary report is written.

For the 2008 Integrated Report, aquifer summary data from the BMP for the Eocene/Paleocene age aquifers, which include the Carrizo-Wilcox, Sparta and Cockfield aquifers, is presented. While these aquifers represent geologically the oldest freshwater aquifers in Louisiana, they include some of the shallowest wells and groundwater in the state.

Data derived from monitoring these three aquifers of the Eocene/Paleocene age period show that the ground water is of good quality when considering short-term or long-term health risk guidelines in that it meets all USEPA Primary Drinking Water Standards. This data also shows that the ground water ranges from soft to moderately hard and that the ground water is of fair quality when considering non-enforceable taste, odor, or appearance guidelines.

Water Pollution Control Programs

LDEQ has been given the responsibility of managing the quality of Louisiana's surface waters by upgrading the quality where man's activities have caused degradation and by preserving the integrity of those waters where good quality exists. Water pollution controls employed by the agency include municipal and industrial wastewater discharge permits, enforcement of permit requirements, review and certification of projects affecting water quality, implementation of best management practices for nonpoint source pollution, and regular water quality monitoring of the state's surface waters.

In 1997 the LDEQ was granted National Pollutant Discharge Elimination System (NPDES) delegation by the USEPA. As a result of delegation, most facilities that discharge to waters of the state are required to obtain only one permit, a Louisiana Pollution Discharge Elimination System (LPDES) permit, rather than both an NPDES permit and a state permit as in the past. In addition to LDEQ's permitting responsibilities, grants and loans for construction and upgrade of municipal treatment facilities are also awarded by USEPA through the LDEQ. In the past, the majority of pollution control programs have been directed at point source discharges through the issuance of wastewater permits, compliance assurance activities, and enforcement activities. While this is still the case, nonpoint source pollution control efforts continue to increase.

Total maximum daily loads (TMDLs) indicate that the majority of the pollutant load entering state waters comes from nonpoint sources of pollution; therefore, LDEQ is implementing a watershed-based approach to reducing those loads in the water bodies where TMDLs have been completed. Presently, LDEQ utilizes both regulatory and non-regulatory mechanisms to control nonpoint sources of pollution. Urban storm water for cities with populations of 50,000 or greater and construction sites of one acre or more are regulated through the LPDES permit program. Home sewage treatment systems are regulated through the LDHH. LDEQ's Water Quality Assessment Division (WQAD) currently houses the state's Nonpoint Source Management Program, which has been successful in implementing voluntary programs to control and reduce nonpoint sources of pollution. This has been done through coordination with other concerned agencies, such as the Louisiana Department of Agriculture and Forestry (LDAF), Louisiana Department of Natural Resources (LDNR), the U.S. Natural Resource Conservation Service (NRCS), parish and city governments, and the Louisiana State University (LSU) AgCenter. LDEQ will continue to monitor state waters through the four-year cyclic process to determine whether the current implementation strategy is successful in restoring and maintaining water quality and the designated uses within Louisiana.

Interim Review Updates

During the extended review period of the 2008 IR following public notice and receipt of comments many updates and corrections were included in the revised Assessment Database (ADB) and subsequent IR spreadsheet. Most (94) of these changes were due to the completion of Total Maximum Daily Loads (TMDLs) for impaired water bodies on the §303(d) list. Eleven changes were the result of ADB entry errors during the original compilation of the assessment information. Eight changes were made to IR categories. Six changes were due to having obtained new data for assessment. One change was simply to remove "Source Unknown" as a suspected source for one subsegment and did not affect the overall impairment status of the water body. The most significant change was the inclusion of suspected dissolved oxygen impairment on three coastal subsegments along the Gulf of Mexico. These include: 021102 – Barataria Basin Coastal Bays and Gulf Waters to the State Three Mile Limit; 070601 – Mississippi Basin Coastal Bays and Gulf Waters to the State Three Mile Limit; and 120806 – Terrebonne Basin Coastal Bays and Gulf Waters to the State Three Mile Limit. This change was made based on additional data provided by USEPA, the Louisiana Department of Wildlife and Fisheries, and the Gulf States Marine Fisheries Program-SeaMap. All interim changes are highlighted and described in the assessment spreadsheet found in Appendix A. More information regarding these additions can be found in the Response to Comments in Appendix G.

PART II: BACKGROUND

Chapter 1: Louisiana Resources

Louisiana Geography and Climate

Louisiana lies entirely in the Gulf Coastal Plain physiographic province and can be divided into five natural physiographic regions: Coastal Marsh, Mississippi Alluvial Valley, Red River Valley, Terraces, and Hills. The state has twelve major river basins, which are described in Appendix A. Maximum elevations in Louisiana are located in the hills of the northwest, where the state's oldest geologic formations are found. The highest elevation in the state is only 535 feet. The lowest elevations in the state are found in the Coastal Marsh area, which extends across the southern portion of Louisiana and represents a valuable fisheries and wildlife resource. Due to levee construction, marsh filling, and subsidence, portions of south Louisiana are below sea level. Because Louisiana's coastal resources differ significantly in physical, chemical, and hydrological characteristics from inland resources, the atlas information provided below for lakes and wetlands has been broken down into two categories: inland and coastal. Those categorized as coastal receive some tidal influx, even though some of the coastal lakes and wetlands are characterized by fresh water vegetation.

Louisiana has a humid subtropical climate influenced by the extensive landmass to the north, the Gulf of Mexico to the south, and the subtropical latitude. Prevalent winds from the south/southeast bring in warm, moist air from the Gulf, resulting in abundant rainfall. The statewide annual average precipitation varies from 48 inches in the northwestern part of the state near Shreveport to 64 inches in the southeastern coastal plains near Thibodaux.

Louisiana Resources Atlas

State Population (2005 Estimate - http://factfinder.census.gov)	4,523,628	
State Surface Area (Land)[1]	43,566	square miles
Percent Land	84%	
State Surface Area (Water)[1]	8,277	square miles
Percent Water	16%	
Major River Basins	12	
Rivers:		
Total River Miles	66,294	miles
Perennial	32,955	miles
Intermittent	20,667	miles
Ditches/Canals	12,672	miles
Border Miles:		
Names and Mileage of Border Rivers		
Total Mileage	484	miles
Pearl River	74	miles
Mississippi River	200	miles
Sabine River (includes Toledo Bend Reservoir)	210	miles
Lakes:		
Total Number of Fresh Water Lakes/Reservoirs	6,603	
Total Acres of Fresh Water Lakes/Reservoirs	1,078,031	acres
Number of Inland Fresh Water Lakes/Reservoirs > 1 sq. mi.	62	
Acres of Inland Fresh Water Lakes/Reservoirs > 1 sq. mi.	474,506	acres
Number of Coastal Fresh Water Lakes/Reservoirs	39	
Acres of Coastal Fresh Water Lakes/Reservoirs	239,213	acres

Wetlands:		
Fresh Water Inland Wetlands	3,000,130	acres
Coastal Wetlands (LDWF, 2001)	4,088,789	acres
Swamp	467,821	acres
Fresh Marsh	1,215,656	acres
Intermediate Marsh	901,441	acres
Brackish Marsh	812,334	acres
Salt Marsh	691,537	acres
Estuaries/Bays:	7,656	square miles
Coastal Miles:	397	miles
Total Miles of Shoreline: (includes islands, bays, rivers and bayous up to head of tide water)	7,721	miles

[1] http://www.netstate.com/states/geography/la_geography.htm

Summary of Classified Uses

Louisiana has established eight designated uses for water bodies in the state. These uses, along with the total size for each use and water body type combination is shown in table 2.1.1. Designated uses and water body types are established in LAC 33:IX.1123. The sizes found in table 2.1.1 are not reflective of the total size for water bodies found in the Louisiana Resources Atlas, above. Rather, these sizes are only for the named water bodies designated as “subsegments” in the LAC. Subsegments are watersheds or portions of watersheds delineated as management units for water quality monitoring, assessment, permitting, and enforcement purposes. A subsegment will often contain numerous smaller tributaries or distributaries within the watershed of the named LAC water body; however, assessments for Integrated Report purposes apply only to the named water body in the subsegment.

Table 2.1.1.

Total sizes of Louisiana water bodies classified for various designated uses. (Louisiana Environmental Regulatory Code 33:IX.1123)

	Water Body Type			
Classified Uses	**Rivers (miles)**	**Lakes (acres)**	**Estuaries (sq. miles)**	**Wetlands (acres)**
Primary Contact Recreation	9,179	660,322	4,954	1,025,280
Secondary Contact Recreation	9,344	660,322	4,954	1,077,053
Fish and Wildlife Propagation	9,262	660,322	4,954	1,077,053
Drinking Water Supply	1,488	264,664	-0-	464,000
Outstanding Natural Resource Waters	1,587	38	-0-	-0-
Oyster Propagation	470	-0-	4,268	-0-
Agriculture	2,044	425,998	-0-	-0-
Limited Aquatic Life and Wildlife Use	82	-0-	-0-	-0-

Chapter 2: Water Pollution Control Program

Watershed Approach

LDEQ reports on water quality in the state by basin subsegment. Louisiana is divided into 12 major watershed basins, and each basin is further divided into water body subsegments. This subsegment approach divides the state’s waters into discrete hydrologic units. The plan for this approach was presented in the 1978 Water Quality Management Plan and underwent a major revision in 1985 to increase hydrologic consistency within each named subsegment. The final draft of the Louisiana Basin Subsegment plan was completed in 1990 and is reviewed periodically to ensure that subsegments are distinct and consistent representations of the state’s hydrology. The water body subsegment system within each watershed basin provides a workable framework to evaluate the state's waters. Subsegments are periodically added or removed as water quality standards related to a subsegment or group of subsegments are revised.

Water Quality Standards Program

Louisiana's water quality standards are the foundation of LDEQ's water quality-based pollution control program and are based upon and authorized by §303(c) of the 1972 Federal Water Pollution Control Act (CWA, 1972) and its more recent amendments. Section 303(c) of the CWA outlines the basic approach to develop and maintain a state's water quality standards. Important provisions of §303(c) are:

- States are required to assign water quality standards to their surface waters. A water quality standard is defined as the designated beneficial use or uses plus water quality criteria to support those uses.
- States must adopt designated uses consistent with CWA beneficial uses including public water supply, propagation of fish and wildlife, recreation, agricultural uses, industrial uses, and navigation.
- State standards must protect public health, enhance water quality, and "serve the purposes of the Clean Water Act." (CWA)[1] (Federal Water Pollution Control Act (FWPCA), 1987).

The states must review their standards at least once every three years using a public participation process. The USEPA has oversight over the state's standards process. If and when a state's standards are not consistent with the applicable requirements of the CWA, the USEPA may impose water quality standards for that state in federal regulations.

Louisiana's water quality standards are described in Title 33 of the LAC, Part IX, Chapter 11 (LAC 33:IX.1101 et seq., as amended). They are adopted as state law, are applicable to surface waters of the state, and are used in permit processes as the basis for effluent limitations for point source discharges. Water quality standards are also used in the CWA Section 305(b) assessment process to determine if a water body is meeting its designated uses. Louisiana's water quality standards include:

- A designated use or uses for waters of the state
- Water quality criteria for these waters based on their uses
- An antidegradation policy
- General policies addressing implementation issues (e.g., mixing zones, variances, low flow conditions)

There are currently eight designated uses adopted for Louisiana's surface waters: primary contact recreation, secondary contact recreation, fish and wildlife propagation, drinking water supply, oyster propagation, agriculture, outstanding natural resource waters, and limited aquatic life and wildlife.

Water Quality Criteria

Water quality criteria are elements of state water quality standards expressed as constituent concentrations, levels, or narrative statements representing the quality of water supporting a particular designated use. When criteria are met, water quality will protect the designated use. Louisiana has both general and numeric criteria in LAC 33:IX.1113. General criteria are expressed in a narrative form (in concise statements) and include aesthetics, color, suspended solids, taste and odor, toxic substances (in general), oil and grease, foam, nutrients, turbidity, flow, radioactive materials, and biological and aquatic community integrity. Numeric criteria are generally expressed as concentrations (e.g., weight measured per liter) or scientific units and include pH, chlorides, sulfates, total dissolved solids, dissolved oxygen, temperature, bacteria, and specific toxic substances. Specific toxic substances are those for which USEPA has published national criteria recommendations. While states generally use USEPA guidance and recommendations in developing and adopting their own criteria, they are allowed the flexibility to develop their own methodology as well. USEPA guidance is under continuous development and revision. States review and incorporate these developments and revisions into their water quality standards as appropriate.

Human health criteria provide guidelines that specify the potential risk of adverse effects to humans due to

[1] "Serve the purposes of the Clean Water Act" means to include provisions for restoring and maintaining the chemical, physical, and biological integrity of State waters, and, wherever attainable, achieve a level of water quality for the protection and propagation of fish, shellfish and wildlife, and recreation "in and on" the water.

substances in the water. Factors considered include body weight, risk level, fish consumption, drinking water intake, and incidental ingestion while swimming. Categories of criteria are then developed for each toxic substance for public drinking water supply, non-drinking water (swimming), and non-swimming water. The basic formulas used by LDEQ come from a Federal Register notice published in 1980 (45 FR 79318).

Aquatic life criteria are designed to protect all aquatic life, including plants and animals. There are two types of criteria: "acute" for short-term exposures (e.g., spills), and "chronic" for long-term or permanent exposures. One or both of the acute and chronic criteria may be related to other water quality characteristics, such as pH, temperature, or hardness. Separate criteria are also developed for fresh and salt waters. The federal water quality standards regulations allow states to develop numerical criteria or modify USEPA's recommended criteria to account for site-specific or other scientifically defensible factors. The guidance developed by USEPA for deriving water quality criteria is contained primarily in Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Life, published in October 1985, available from the National Technical Information Source (NTIS), publication number PB85-227049 (NTIS, 1985) or from the USEPA web site at http://www.epa.gov/waterscience/criteria/library/85guidelines.pdf.

Listings of specific toxic criteria for human health and aquatic life for Louisiana are found in LAC 33:IX.1113.C.6, table 1. The development of national aquatic life and human health criteria is a dynamic process that takes into consideration the best defensible scientific information available.

Use Attainability Analyses (UAAs)

Section 101(a)(2) of the CWA states it is the national goal that "wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water be attained..." To achieve the national goal, all Louisiana streams were originally assigned designated uses that were applied statewide. Criteria to support the designated uses were also assigned statewide in response to federal regulations promulgated to achieve CWA goals. Since that time, both state and federal agencies have recognized the need to establish more site-specific standards, i.e., designated uses and the criteria to support them.

Designated uses that are not existing uses may be changed or removed from water bodies, or criteria made less stringent, if it can be demonstrated that the designated uses or criteria are unattainable for any one (or more) of six reasons found in the state LAC and federal (Code of Federal Regulations (CFR) regulations (LAC 33:IX.1109.B.3.a-f and 40 CFR §131.10). The mechanism for change is called a Use Attainability Analysis (UAA), which is conducted as appropriate to determine the uses and criteria a water body can attain. According to the regulations, a UAA is defined as a "structured scientific assessment of the factors affecting the attainment of a use that may include physical, chemical, biological, and economic factors" (See also 40 CFR §131.3(g) and LAC 33:IX.1105.). The UAA process entails the methodical collection of data that is scientifically analyzed, summarized, and used to make recommendations for site-specific uses and the criteria to support them. Acceptable methods used in conducting the UAA process are described in USEPA guidance documents (See also 40 CFR §131.10 and LAC 33:IX.1109.B.3.).

UAAs for site-specific criteria and uses may be developed for a specific water body, water body type (e.g., wetlands), ecoregion, or for a watershed. LDEQ has developed categories in the water quality standards and Water Quality Management Plan for intermittent streams, man-made water bodies, and naturally dystrophic waters (LAC 33:IX.1109.C). As with the development of site-specific UAAs, proposed uses and criteria based on these categories also require a UAA. Several water bodies in Louisiana have site-specific criteria and uses assigned to them based on UAAs developed in close coordination with USEPA. The USEPA must approve any revisions to the water quality standards, uses, or criteria before they are implemented, including revisions based on UAAs (40 CFR 131.21).

UAAs typically include historical and current data and information gathered from existing sources. When existing data are insufficient, LDEQ will conduct additional physical, chemical, and/or biological sampling at sites where designated uses and/or criteria changes are being considered. Frequently this type of site-specific data collection is performed in conjunction with LDEQ's TMDL program intensive survey work.

Louisiana's Nutrient Criteria Development Strategy

In 1998, the Office of the President announced "The Clean Water Action Plan" that included a requirement for states to develop and adopt numerical nutrient criteria. LDEQ has been working with USEPA Region 6 toward accomplishing this goal. It has been recognized that "one size fits all" criteria for nutrients will not be appropriate, and that each state's nutrient criteria will need to be water body-specific and fit within an appropriate ecoregion framework.

USEPA has published numeric nutrient criteria recommendations for several national ecoregions. These recommendations were developed using a statistical methodology, primarily percentiles. In November 2001, USEPA issued further guidance in the form of a memorandum that clarified the flexibility that states have in their development of defensible nutrient criteria, and extended the deadline for states to have a "mutually agreed upon" nutrient criteria development plan to USEPA by December 2006. LDEQ's nutrient criteria development plan (approved by USEPA on June 20, 2006) is available at http://www.deq.louisiana.gov/portal/tabid/69/Default.aspx under the bullet "Developing Nutrient Criteria for Louisiana: 2006." This plan will be updated to reflect progress in nutrient criteria development and any changes to criteria development approaches.

LDEQ evaluated the nutrient data and criteria recommendations published using USEPA's methodology and has concluded that the methodology is not entirely suitable for Louisiana's water bodies. LDEQ, in accordance with its nutrient criteria development plan, is now proceeding with developing scientifically defensible and appropriate criteria for Louisiana's water bodies. In this regard, LDEQ is working closely with the academic community and the U.S. Geological Survey (USGS) to incorporate the latest scientific research in developing defensible approaches to nutrient criteria development. LDEQ also continues public outreach efforts to educate, inform and seek input from stakeholders about nutrient criteria development for Louisiana water bodies. More information on the National Nutrient Strategy is available at http://www.epa.gov/ost/standards/nutrient.html.

Development of Wetland Water Quality Standards

LDEQ is in the process of developing a category for wetlands in the water quality standards. This category would also contain uses and water quality criteria to protect the types of wetlands found in Louisiana. Currently, regulations and implementation procedures have been developed by LDEQ for discharges of treated wastewater (effluent) into natural wetlands. Each candidate site is evaluated on a case by case basis. A preliminary study is first performed, and if LDEQ determines the site meets the criteria to receive a discharge, then the application and baseline studies can be completed and submitted to LDEQ. In Louisiana there is also an interest in the beneficial use of treated wastewater or effluent to provide nutrients for subsiding wetland systems. This process, known as wetlands assimilation, is described in more detail in the following section.

Water Quality Monitoring and Assessment Program

LDEQ conducts extensive surface and ground water sampling throughout Louisiana in order to obtain information regarding the quality of Louisiana's surface and ground water resources. Data obtained from this program is used to develop reports, including the 2008 Water Quality Inventory: Integrated Report, in order to inform the public, state, and federal agencies as to the quality of Louisiana water. More information on this program can be found in Part III of this report.

Point Source Control Program

Introduction

Louisiana's water pollution control program is carried out through the LDEQ. LDEQ operates to preserve the integrity of Louisiana's waters through the use of various point and nonpoint source programs. Responsibility for these programs is dispersed among the major offices of the department. These include the Office of the Secretary (regulatory development), the Office of Management and Finance (contracts and grants, municipal facilities revolving loan program), the Office of Environmental Services (municipal and industrial wastewater discharge permitting and water quality certification program), the Office of Environmental Compliance (surveillance and enforcement of permit requirements and pollution control regulations, investigation of complaints and spills), and the Office of Environmental Assessment (water quality assessment, review and recommendation of standards and nonpoint source programs). Brief descriptions of the various facets of the water pollution control program not already discussed above along with recent activities are provided in the following sections.

Municipal Facilities Revolving Loan Fund

The Municipal Facilities Revolving Loan Fund Program provides financial assistance for the construction of projects to enhance and improve water quality in Louisiana. Loans are below market rate and may be used for water quality improvement projects in Louisiana communities.

Monies for the Revolving Loan Program originated with the 1987 amendments to the CWA. A new authority was created, allowing USEPA to make grants to capitalize State Water Pollution Control Revolving Funds. On the state level, R.S. 30:2011(D) (4), R.S. 30:2074(A) (4) and (B) (6), and R.S. 30:2078 provided for the establishment of the Municipal Facilities Revolving Loan Fund and the required 20% state matching funds.

Loans are made for no longer than 20 years and may be repaid through sales taxes, user fees, ad valorem taxes, or a combination of funds. An interest payment on the amount drawn begins within six months of the loan closing and is billed every six months until the loan is paid in full. After a two-year construction period, loan recipients begin repayment of principal to LDEQ. That money is then available for loans to other communities. Thus, the revolving loan fund is a permanent source of funds for Louisiana municipalities.

As of January, 2008, the USEPA, through LDEQ, has awarded $285,815,768 in fund capitalization grants to Louisiana. With the required 20% state match of $57,163,154, less 4% for administration fees, this makes $331,531,927 available for loans to communities. In addition, a total of $161,452,235 of repaid "recycled" loan monies has been made available for loans. As of this date, 95 loans totaling $472,147,900 have been closed utilizing USEPA grants, state match and recycled payments from previous loans.

Wastewater Discharge Permits

Wastewater permits are official authorization developed and promulgated by the Office of Environmental Services of LDEQ. The LPDES (Louisiana Pollutant Discharge Elimination System) permit establishes the wasteload content of wastewaters discharged into waters of the state. The permitting process allows the state to control the amounts and types of wastewaters discharged into its surface waters. A permit is required for every point source discharge into waters of the state of Louisiana. In 1996 LDEQ assumed responsibility for administering the permitting, compliance, and enforcement activities of the National Pollutant Discharge Elimination System (NPDES) from the USEPA. USEPA retained responsibility for the sewage sludge disposal program, municipal separate storm sewer system, and authority for offshore discharges past the three-mile territorial seas limit. From January 2006 to December 2007, the following permits were prepared:

Table 2.2.1.

Louisiana Pollutant Discharge Elimination System water quality permits and modifications issued in Louisiana. January 2006-December 2007.

State Permit	Number of Permits	Number of Permits (including modifications)
Minor Sanitary	143	147
Major Sanitary	42	44
Minor Industrial	230	267
Major Industrial	49	73
Major MS4[1]	2	3
Stormwater General	2,686	2,686
Non-Stormwater General	2,199	2,199
Totals	**5,351**	**5,419**

[1]Major Municipal Stormwater Permits

Surveillance Compliance Assurance Inspections

Municipal, industrial, federal, and agricultural point source dischargers are monitored to verify compliance with permitted effluent limitations and compliance schedules. The information derived from this program can also be applied to the interpretation of state water quality data and can be used as input to water quality plan development.

The types of compliance inspections undertaken by the Surveillance Division that are reported here include:

- Compliance Evaluation Inspections (CEI): Non-sampling inspections are designed to verify permittee compliance with applicable LPDES/state permit requirements and compliance schedules.
- Compliance Sampling Inspections (CSI): Samples of the influent and/or effluent are collected and analyzed to determine permit compliance, in addition to the inspection activities performed in the CEIs.

The following reported numbers do not include complaint- or spill-related inspections. The following compliance inspection activities were conducted from January 2006 through December 2007:

Table 2.2.2.

Louisiana water quality compliance inspections conducted from January 2006 through December 2007.

Inspection Type	Number of Inspections
Compliance Evaluation Inspections	2,614
Compliance Sampling Inspections	182
Total Compliance Inspections	**2,796**

Surveillance Incident Investigations

The Surveillance Division of the Office of Environmental Compliance received 8,082 environmental complaints across all media during the calendar years 2006 and 2007. Each complaint requires an incident report form and an investigation. If action is deemed necessary following the initial investigation, the investigator refers the situation to the appropriate division for enforcement action, permit action, or remedial action. The division receives notifications that include reports of oil spills, sewage overflows, bypasses, water permit excursions, chemical spills, fish kills, unusual coloring in a stream, and illegal discharges. Spill and release notifications and environmental complaints are made to the Single Point of Contact (SPOC). Notifications of emergencies are reported to the Louisiana State Police (LSP). LSP then notifies the LDEQ staff person on-call. Non-emergency conditions are reported directly to the SPOC during normal business hours.

Table 2.2.3.

Louisiana water quality surveillance incident investigations conducted from January 2006-December 2007.

Notification Type	Number of Notifications
Complaint Notifications	8,082
Spill Notifications	8,541
Total	**16,623**

Water Quality Certification

Water quality certification is an activity of the Office of Environmental Services (OES) (Permits Division, Registrations and Certifications Section) of LDEQ. Certification is required for any activity that results in a discharge or a potential change to the waters of the state, including land clearing and drainage of agricultural lands, coastal use, certain highway construction and sewage collection projects, and bridge construction. Section 401 of the CWA requires water quality certification for all §402 (National Pollutant Discharge Elimination System) or §404 (dredge/fill) permits and, therefore, applies to both point source and nonpoint source discharges. Through the certification process, the OES is involved in the review of all environmental impact statements in order to assess potential impacts of any proposed project on waters of the state. From January 2006 to December 2007, 1,371water quality certifications were issued by LDEQ.

Enforcement

The enforcement activities of the Office of Environmental Compliance (OEC), Enforcement Section are designed to ensure that all water quality standards, rules, and regulations are handled in a rapid and consistent manner. To prevent pollution of the waters of the state and to ensure remediation in the event of pollution, the Enforcement Section coordinates its enforcement activities with other sections in LDEQ, especially the Permits Section in the OES and the Surveillance Section of the OEC. Field investigations, file reviews, permit non-compliances and reviews of discharge monitoring reports (DMRs) are all used to initiate enforcement actions. The Enforcement Section initiates all formal enforcement actions and follows the actions through all appropriate levels to ensure full compliance with state laws and regulations. LDEQ seeks to provide a clean, healthy environment through protection of the state's water resources by the reduction of pollution, education of the public, and consistent, open, and accountable application of standards, rules and regulations. Between January 2006 and December 2007, the following activities were recorded:

Table 2.2.4.

Louisiana water quality environmental enforcement actions issued from January 2006 through December 2007.

Enforcement Actions	Number
Notice Of Corrected Violations	25
Compliance Orders (CO)[1]	278
Notice of Potential Penalty (NOPP)	29
Administrative Orders	19
Penalties	82
Settlement Agreements	25

[1]Includes CO and Consolidated CO/NOPP

Table 2.2.5.

Louisiana water quality environmental penalties issued from January 2006 through December 2007.

Penalties	Dollar Value
Penalties Issued	$99,072
Penalties Paid	$90,056
Penalties Appealed	$9,016
Cash From Settlement Agreements	$2,169,865
Total Value of BEPs[2]	**$7,520,000**

[2]Beneficial Environmental Projects

Nonpoint Source Control Program

Introduction

As the State of Louisiana continues to make progress in managing the types of pollution that come from point sources such as industrial and municipal waste waters, more emphasis is being placed on identifying and controlling the types of pollution associated with nonpoint sources. These nonpoint pollution problems come from land-use activities and contribute sediments, nutrients, metals, organic material, and bacteria to water bodies throughout the state. This type of pollution is called nonpoint source (NPS) pollution because it typically does not come from a single point of discharge such as a pipe, but runs across the land when it rains and is carried through small canals and streams to major water bodies. The types of land-use activities that have been identified as contributing to NPS include: agriculture, forestry, urban, home sewage systems, construction, hydromodification, and resource extraction (sand and gravel mining). Some of these sources of pollution are managed through storm water permits and others are managed through voluntary programs at the statewide and watershed level.

For purposes of implementing NPS pollution programs, the Louisiana Environmental Regulatory Code [Title 33: Part IX] defines NPS pollution as: a diffuse source of water pollution that does not discharge through a point source but instead flows freely across exposed natural or man-made surfaces such as agricultural or urban runoff and runoff from construction, mining, or silviculture activities.

Section 319 of the Clean Water Act

Section 319 of the CWA was enacted to specifically address problems related to NPS pollution. The objective of the Act was to restore and maintain the chemical, physical and biological integrity of the nation's waters. It mandated the Nonpoint Source Management Program (LDEQ, 1987), which instructed the governor of each state to prepare and submit a program for control and reduction of NPS pollution from nonpoint sources into navigable waters within the state by implementation of a four-year management plan.

In response to this federal law, the State of Louisiana passed Revised Statute 30:2011, signed by the governor in 1987 as Act 272. This law directed the LDEQ, designated as the lead agency for the NPS program, to develop and implement a NPS Management Program. The NPS Management Program was developed to facilitate coordination with appropriate state agencies including, but not limited to, the Louisiana Department of Natural Resources (LDNR), the Louisiana Department of Wildlife and Fisheries (LDWF), the Louisiana Department of Agriculture and Forestry (LDAF), and the state Soil and Water Conservation Committee, in those areas pertaining to their respective jurisdictions.

Nonpoint Source Assessment

Section 319(a) of the CWA requires that states prepare a Nonpoint Source Assessment Report, which includes the following elements: (All references to sections, subsections, paragraphs and subparagraphs are from CWA §319.)

- An identification of those navigable waters within the state which, without additional action to control nonpoint sources of pollution, cannot reasonably be expected to attain or maintain applicable water quality standards or the goals and requirements of the CWA;
- An identification of those categories and subcategories of nonpoint sources which add significant pollution to each portion of the navigable waters identified under subparagraph (A) in amounts which contribute to such portion not meeting such water quality standards or such goals and requirements;
- A description of the process, including intergovernmental coordination and public participation, for identifying best management practices and measures to control each category and subcategory of nonpoint sources and, where appropriate, particular nonpoint sources identified under subparagraph (B) and to reduce to the maximum extent practicable the level of pollution resulting from each category, subcategory or source;
- An identification and description of state and local programs for controlling pollution added from nonpoint sources to, and improving the quality of, each such portion of the navigable waters, including but not limited to those programs which are receiving federal assistance under subsections (h) and (i).

Nonpoint Source Pollution Management Program

Section 319(b) requires that the states prepare a Nonpoint Source Management Plan, which includes the following elements: (All references to sections, subsections, paragraphs and subparagraphs are from CWA §319.)

- An identification of best management practices (BMPs) and measures which will be undertaken to reduce pollutant loadings resulting from each category, subcategory or particular NPS designated under paragraph (1)(B), taking into account the impact of the practice on ground water quality.
- An identification of programs (including, as appropriate, non-regulatory or regulatory programs for enforcement, technical assistance, financial assistance, education, training, technology transfer and demonstration projects) to achieve implementation of the best management practices by categories, subcategories and particular nonpoint sources designated under subsection (A).
- A schedule containing annual milestones for (a) utilization of the program implementation methods identified in subparagraph (B) and (b) implementation of the best management practices identified in subparagraph (A) by the categories, subcategories or particular nonpoint sources designated under paragraph (1)(B). Such schedule shall provide for utilization of the BMPs at the earliest practicable date.
- A certification of the attorney general of the state or states (or the chief attorney of any state water pollution control agency which has independent legal counsel) that the laws of the state or states, as the case may be, provide adequate authority to implement such management program or, if there is not such adequate authority, a list of such additional authorities as will be necessary to implement such management program, and a schedule and commitment by the state or states to seek such additional authorities as expeditiously as practicable.
- Sources of federal and other assistance and funding (other than assistance provided under subsections (h) and (i)) which will be available in each of such fiscal years for supporting implementation of such practices and measures and the purposes for which such assistance will be used in each of such fiscal years.
- An identification of federal financial assistance programs and federal development projects for which the state will review individual assistance applications or development projects for their effect on water quality pursuant to procedures set forth in Executive Order 12372 as in effect on September 17, 1983, to determine whether such assistance applications or development projects would be consistent with the program prepared under this subsection; for the purposes of this subparagraph, identification shall not be limited to the assistance programs or development projects subject to Executive Order 12372 but may include any programs listed in the most recent Catalog of Federal Domestic Assistance which may have an effect on the purposes and objectives of the state's NPS pollution management program.

In 1993, the USEPA approved Louisiana's Nonpoint Source Assessment Report and Management Plan. During the next seven years, LDEQ worked cooperatively with other federal, state, and local agencies and non-profit organizations to implement the goals and objectives of the 1993 documents. In August 2000, USEPA Region 6 approved the revised NPS Management Plan that addressed the nine key elements that the USEPA required of all states in order to upgrade their programs. The revised plan also included the required elements of the NPS Assessment Report. These nine key elements have been summarized below.

USEPA's Nine Key Elements

In 1997, USEPA Headquarters issued revised guidance to the states, which described the process that states should utilize to upgrade their Nonpoint Source Management Plans. This revision process was based on nine key elements, which USEPA wanted to see included in the revised programs. These key elements defined the programmatic goals more clearly that the states should utilize to reduce nonpoint source pollution and improve water quality. The nine key elements include:

- The State program contains explicit short- and long-term goals, objectives, and strategies to protect surface and ground water.
- The State strengthens its working partnerships and linkages with appropriate state, interstate, tribal, regional, and local entities (including conservation districts), private sector groups, citizen groups, and federal agencies.

- The State uses a balanced approach that emphasizes both statewide NPS programs and on-the ground management of individual watersheds where waters are impaired and threatened.
- The State program (a) abates known water quality impairments from NPS pollution and (b) prevents significant threats to water quality from present and future activities.
- The State program identifies waters and their watersheds impaired by NPS pollution and identifies important unimpaired waters that are threatened or otherwise at risk. Further, the State establishes a process to progressively address these identified waters by conducting more detailed watershed assessments and developing watershed implementation plans, and then by implementing the plans.
- The State reviews, upgrades, and implements all program components required by §319(b) of the CWA and establishes flexible, targeted, and iterative approaches to achieve and maintain beneficial uses of water as expeditiously as practicable. The State programs include the following:
    - A mix of water quality-based and/or technology-based programs designed to achieve and maintain beneficial uses of water;
    - A mix of regulatory, non-regulatory, financial, and technical assistance as needed to achieve and maintain beneficial uses of waters as expeditiously as practicable.
- The State identifies federal lands and activities which are not managed consistently with state NPS program objectives. Where appropriate, the State seeks USEPA assistance to help resolve issues.
- The State manages and implements its NPS program efficiently and effectively, including necessary financial management.
- The State periodically reviews and evaluates its NPS management program using environmental and functional measures of success and revises its NPS assessment and its management program at least every five years.

Watershed Planning and Management

USEPA and the State of Louisiana have agreed that a watershed approach to water quality planning and management is a logical, systematic way to reduce and control nonpoint sources of pollution. Through the watershed planning process, water quality data is analyzed, total maximum daily loads are developed, and watershed plans are written for water bodies on the state's §303(d) list of impaired waters. The watershed plan becomes the basis for targeting the type of problems within the watershed to focus §319 funds to solve existing water quality problems. USEPA has outlined a set of elements that they believe comprise a workable watershed plan, and LDEQ has utilized this outline as a guide to create watershed plans. The watershed plans include the following:

- Identification of geographic extent of the watershed, the measurable water quality goals, and the causes and sources that will need to be controlled to achieve the water quality goals.
- Description of NPS management practices that will need to be implemented to achieve the estimated load reductions.
- A description of the agencies and programs that are available to implement the NPS management practices.
- An identification of sources and amounts of financial and technical assistance that are estimated to be available to implement the management practices.
- An information/education component that identifies the education and outreach that will be used to implement the plan.
- A schedule for implementing the watershed plan that is reasonably expeditious.
- A description of interim, measurable milestones for determining whether NPS management practices or other control actions are being implemented.

- An adaptive implementation process that includes a set of criteria that can be used to determine 1) whether NPS loading reductions are being achieved over time; and 2) whether substantial progress is being made towards attaining, or assuring continued attainment of, water quality standards and, if not, the criteria for determining whether the watershed-based plan needs to be revised; and 3) where an NPS TMDL has been established, whether the NPS TMDL needs to be revised or a new TMDL needs to be developed for waters in the watershed.
- A monitoring component to determine whether the watershed plan is being implemented and applicable water quality standards are being attained or maintained.

Implementation

The primary objective of the Nonpoint Source Management Program is to implement BMPs that will reduce the level of NPS pollution in the surface and ground waters of the state. In addition to BMP implementation, educational programs are held at the local level in order to educate residents about NPS pollution problems and about BMPs recommended by state and federal agencies to reduce and/or correct these problems. Demonstration projects are also an important component of the implementation process. These projects function as an educational tool through demonstration of the recommended management practice to the general public, developers, city planners, engineers, or landowners regarding a specific NPS problem. These projects also allow LDEQ the opportunity to gather quantitative data and information on the effectiveness of the management practice recommended for reduction of NPS pollution (sediments, nutrients, pesticides, and metals). This evaluation of BMPs is reported back to the interagency committee through a feedback loop that allows continuous adjustment of the management practice recommended for NPS abatement. Through this implementation process, corrective measures to reduce the level of sediments, metals, nutrients, and pesticides entering surface and ground waters of the state have been initiated. For this program to be successful, it will take the continued cooperative efforts of the government agencies that have authority and management responsibilities for state, federal, and private lands within Louisiana. More information on implementation of LDEQ's Nonpoint Source Program can be found in the Nonpoint Source Management Plan and the Annual Report for the program or through the Internet at: http://nonpoint.deq.louisiana.gov/wqa/default.htm.

Coordination With Other Agencies

The LDEQ Office of Environmental Assessment (OEA) coordinates their activities with various other federal, state, and local agencies and organizations. This coordination takes a number of different forms.

As a recipient of federal grants administered by USEPA, LDEQ must work closely with USEPA to ensure that all obligations and goals of the grants are fulfilled. LDEQ in turn utilizes these grant funds to support its programs and implement NPS management and demonstration projects through a variety of state, parish, and federal partners, nonprofit organizations, and universities. The NPS program within the Water Quality Assessment Division, manages these projects in order to find solutions to NPS pollution in the state. The section entitled Nonpoint Source Control Program in this chapter has details on a variety of activities undertaken by the NPS program.

LDEQ staff participates on several national, state and regional task forces, committees, and programs. Among these are the Gulf of Mexico Program (GOMP), which is aimed at focusing awareness of the Gulf's pollution, habitat, fisheries, and other problems, and finding workable solutions to them. Another program supported by personnel from LDEQ is the Lower Mississippi River Conservation Committee (LMRCC). Like the GOMP, the LMRCC's goal is to identify and find solutions to problems that exist among states along the lower Mississippi River south of the Ohio River. LDEQ also represents the state on the Coastal Wetlands Conservation and Restoration Task Force and Project Restore. Both are state efforts to address coastal land loss. LDEQ also maintains representation on the Lake Pontchartrain Basin Foundation (LPBF) board. The LPBF is charged with seeking solutions to and raising citizen awareness of pollution problems in Lake Pontchartrain and the surrounding watershed. The Southern States Mercury Task Force includes personnel from LDEQ. This task force serves as a forum for exchange of information among states concerning the problem of mercury contamination of fish tissue. LDEQ also maintains representation in the Barataria-Terrebonne National Estuary Program management conference. Finally, LDEQ maintains a seat on the Louisiana Aquatic Invasive Species Council (LAISC). This group was charged with developing a management plan for addressing aquatic invasive species. The task force recently developed legislation to create a permanent council and advisory task force for coordination of actions aimed at controlling or preventing the spread of invasive or potentially invasive aquatic species.

LDEQ's Aquifer Evaluation and Protection Program (AEPP) engages in several coordinated efforts as part of its responsibility to protect ground water and drinking water in Louisiana. The Louisiana Department of Health and Hospitals (LDHH) updates LDEQ on changes in watershed protection areas found when conducting sanitary surveys around public supply wells. The LDNR consults with the AEPP regarding new injection wells or large withdrawal wells that may adversely impact a drinking water supply aquifer. The Natural Resource Conservation Service uses LDEQ Source Water Protection Areas in the Conservation Reserve Program in order to take agricultural land near public water supply wells out of production. This program helps keep herbicides and pesticides that could contaminate aquifers away from water supply wells.

Another aspect of coordination between LDEQ and other agencies is in the area of direct field research. For example, LDEQ maintains a cooperative agreement with the USGS in an effort to link LDEQ's ambient water quality data with stream flow data. Under this arrangement, USGS personnel determine stream flow at selected LDEQ water sample sites. This information is later provided to LDEQ so that stream flow can be included with water quality data. Through this project, LDEQ personnel and other researchers will be able to analyze in-stream loading of water parameters in addition to simple concentrations. The stream flow data is also utilized by LDEQ permit writers in deriving effluent limitations for wastewater discharges.

A final area of coordination involves LDEQ, the LDHH, and the LDWF in the setting of fish consumption and swimming advisories. Under this arrangement, LDEQ generally collects water and fish tissue samples. LDHH laboratories test water samples for the presence of fecal coliform bacteria, and results are shared by LDEQ and LDHH. Contract laboratories analyze fish tissue samples with results provided to LDHH for risk analysis. After a decision has been reached on the need for fish consumption or swimming advisories, the LDWF is also notified so that informational bulletins can be provided when fishing licenses are purchased. A news release is then prepared describing the advisory, why it was established, and the source of the problem, if known. More information on fish consumption and swimming advisories in Louisiana can be found in Part III, Chapter 7, and on the LDEQ Website at: http://www.deq.louisiana.gov/portal/default.aspx?tabid=1631.

Chapter 3: Cost/Benefit Assessment

The following information was taken from the 2006 Integrated Report.

Cost Information

A true cost/benefit assessment for the water quality management efforts of the LDEQ is very difficult to obtain. This is due to the fact that research on the economic value of incremental improvements in water quality is not currently available. While recent economic research has begun to place monetary values on otherwise intangible environmental benefits such as wilderness for non-consumptive recreation, such efforts have not taken place in the area of water quality. In addition to the lack of economic assessments, water quality assessment methods presently provide only a "snapshot" look at water quality as directed by §305(b) guidance provided by the USEPA. Some effort has been made to compare these biennial assessments in order to determine changes in water quality over time. However, this has been largely unsuccessful due to changes in evaluation protocols. Therefore, in lieu of a formal cost/benefit assessment of water quality improvements, the LDEQ is providing information on pollution abatement capital expenditures and operating costs for Louisiana. To place these expenditures in perspective, financial information on activities that benefit from this investment is also provided. However, first there is a general discussion of LDEQ funding for water quality protection related activities.

Much of the water quality related budget is self-generated through permit fees and enforcement actions; however, a portion is derived through federal grants. These include the CWA §106 grant for water pollution control activities, the §319 grant for nonpoint source management activities, and the §604 grant for state water quality management planning activities. Money from each of these grants is divided throughout the water quality related sections as directed by each grant, and provides funding for personnel, equipment, survey and research work, and monitoring. Please see table 2.3.1 for an illustration of LDEQ’s approximate yearly costs to implement the CWA. Described below are a few of the programs and activities supported by each of these federal grants and state funds.

Notable among these grants in its achievements is the §319 grant for nonpoint source management issues. LDEQ continues to work with universities, city and parish officials, private industry, and the federal government on over 40 projects that target NPS pollutants from urban runoff, forestry, agriculture, sand and gravel operations, and home sewage treatment systems. During 2006, the U.S. Department of Agriculture (USDA) implemented 1,000 contracts, totaling $14,650,000 in federal funds through the Environmental Quality Incentive Program (National Resources Conservation Service) to implement agricultural best management practices that reduce the amount of nonpoint source pollutants entering water bodies within the state. During this same time period, an additional 48 contracts, totaling $342,786 in federal funds were utilized to implement the Wildlife Habitat Incentive Program (WHIP) on private lands. The Conservation Reserve Enhancement Program (CREP) in northeastern Louisiana has enrolled more than 34,000 acres in long term agreements to convert highly erodible lands to pastures or forests. More than 275,000 acres have been enrolled in CREP, which also takes highly erodible lands out of production in order to reduce the amount of sediments entering the water bodies. All of these programs work with LDEQ’s NPS Program to reduce water quality impacts from agricultural production within Louisiana. LDEQ continues to work closely with USDA to make progress in reducing nonpoint source pollutants and improving water quality. Part II, Chapter Two, Nonpoint Source Pollution Control has more information on this topic as well as other efforts by the Nonpoint Source Program at LDEQ.

Section 604 grant monies are used to support development of TMDLs.

The Municipal Facilities Revolving Loan Fund Program provides financial assistance for the construction of projects to enhance and improve water quality in Louisiana. Loans are below market rate and may be used for water quality improvement projects in Louisiana communities. Monies for the Revolving Loan Program originated with the 1987 amendments to the CWA. A new authority was created, allowing USEPA to make grants to capitalize State Water Pollution Control Revolving Funds. On the state level, R.S. 30:2011(D) (4), R.S. 30:2074(A) (4) and (B) (6), and R.S. 30:2078 provided for the establishment of the Municipal Facilities Revolving Loan Fund and the required 20% state matching funds.

Table 2.3.1.

Approximate costs to implement Clean Water Act by the Louisiana Department of Environmental Quality and its contractors.

Description	Amount
Federal Funds	
CWA Section 106 FY06	$5,976,000.00
CWA Section 604(b) FY06	$200,000.00
CWA Section 319 FY06	$4,500,000.00
Total Federal Funds	$10,676,000.00
State Funds	
Environmental Trust Fund and Other Fees	$9,940,000.00
General Fund	$300,000.00
Total State Funds	$10,240,000.00
Grand Total	**$20,916,000,00**

Loans are made for no longer than 20 years and may be repaid through sales taxes, user fees, ad valorem taxes, or a combination of funds. An interest payment on the amount drawn begins within six months of the loan closing and is billed every six months until the loan is paid in full. After a two-year construction period, loan recipients begin repayment of principal to LDEQ. That money is then available for loans to other communities. Thus, the revolving loan fund is a permanent source of funds for Louisiana municipalities.

As of January, 2006, the USEPA, through LDEQ, has awarded $276,192,068 in fund capitalization grants to Louisiana. With the required 20% state match of $55,238,414, less 4% for administration fees, this makes $320,382,799 available for loans to communities. In addition, a total of $136,360,813 of repaid “recycled” loan monies has been made available for loans. As of this date, 77 loans to communities totaling $431,037,381 have been closed utilizing USEPA grants, state match and recycled payments from previous loans. Another six requests for loans totaling $43,570,000 have been received and are in the application process.

Finally, the §106 grant provides funding support for the entire water pollution control/water quality management program. Activities supported by the §106 grant include ambient water quality monitoring, assessment of ambient water quality data, development of the Water Quality Inventory (now known as the Integrated Report), revision of Louisiana's Water Quality Management Plan, development and revision of surface water quality standards, development and issuance of waste water discharge permits, compliance inspections, complaint investigations, and development of enforcement actions. However, it should be noted that the §106 funds only provide a small percentage of the total cost of Louisiana’s water quality management program.

Data on pollution abatement capital expenditures and operating costs from the U.S. Bureau of the Census publication, Current Industrial Reports, has been included to provide estimates of the costs to the state and local jurisdictions and to industry related to water quality protection and improvement. For 1999, the most recent year for which data is available, government and industry in Louisiana spent $105.5 million in capital expenditures to protect water quality. For the same period, water quality related operating costs for Louisiana totaled $211.4 million. This represents a $316.9 million expenditure for water pollution control related expenses (U.S. Bureau of the Census, 1999).

In an attempt to place these state and industry expenditures in perspective and to provide an approximation of a cost/benefit assessment, information on the size of Louisiana's water resources and its economic benefits to the state, both directly and indirectly, is provided below.

Benefits Information

Louisiana's water resources occupy 8,277 square miles of the total state surface area of 43,566 square miles[1]. As a result, with regard to water quality LDEQ is responsible for the protection of approximately 19% of the total surface area of the state. In many instances protection of surface waters also involves the management of storm water runoff from land based activities such as farming, aquaculture and forestry. This greatly increases the effective area for which the LDEQ is either directly or indirectly responsible.

[1]http://www.netstate.com/states/geography/la_geography.htm

Information provided by the Louisiana Department of Wildlife and Fisheries, (LDWF, 2005), 2004-2005 annual report on commercial fisheries reported that the shrimp fishery is Louisiana’s most valuable commercial fishery. Louisiana leads the nation in shrimp landings with almost 84.7 million pounds landed in 2004. The dockside value was about $139.8 million. Additionally, Louisiana blue crab landings for 2004 totaled 44.1 million pounds and stone crab landings were 1,669 pounds. The state consistently produces one of the largest and most valuable oyster resources in the nation, averaging over 14 million pounds per year. The dockside value is over $35.2 million. The total value of commercial landings exceeded $276 million in 2004.

The LDWF also surveyed the licensed recreational fishery in the state. More than 1.1 million anglers took over 4.8 million marine recreational fishing trips in 2004. About 15.9 million spotted sea trout and 5.4 million red drum were caught in Louisiana in 2004. In 2001, Louisiana saltwater anglers, both resident and non-resident, spent approximately $410 million for fishing trips, equipment, and other miscellaneous expenses. The total 2001 economic impact of marine recreational anglers to Louisiana was approximately $746 million (LDWF, 2002a).

Both recreational and commercial fishing have an obvious relationship to Louisiana's water resources. Not so obvious is the connection between hunting/non-consumptive wildlife activities and water resources. Over 109,000 deer hunters participated in hunting activities during the period (LDWF, 2005). There were also 45,600 dove hunters, 2,000 quail hunters, 3,000 woodcock hunters, and 26,000 turkey hunters. In 2002, an estimated 935,000 participants engaged in wildlife watching, resulting in expenditures of $138.4 million (LDWF, 2002b).

While hunting and non-consumptive wildlife activities are not often directly associated with water quality, it must be recognized that terrestrial wildlife and especially waterfowl are dependent on the availability of high quality waters. Further, hunters and non-consumptive users alike are less likely to participate in their preferred activities in areas of questionable water and aesthetic quality. A holistic approach to environmental and resource management requires that consideration be given to all wildlife, both aquatic and terrestrial, because all require clean water for their survival. While the total contribution of fishing, hunting, and non-consumptive recreation cannot be directly related to water resources, almost all of it can be associated with the need for clean water.

As stated in the 2004 Louisiana Integrated Report, an investment of $316.9 million in water quality pollution abatement capital expenditures and operating costs protected a $5.8 billion industry (LDEQ, 2004). This financial outlay amounted to less than 6% of the value of the annual benefits. As of mid-2006, commercial fisheries and other water quality-dependent sectors of Louisiana’s economy are already on the rebound from the devastating hurricanes of 2005. So it is quite clear that the proven financial returns to Louisiana are well worth the costs incurred.

Although the connection is not so direct, clean water is also important to the tourism industry. The Department of Culture, Recreation and Tourism (DCRT), Office of Tourism Annual Report for Fiscal Year 2002-2003 states that 21.2 million U.S. resident visitors came to Louisiana, as did 500,000 international visitors (Louisiana Office of Tourism (LOT), 2003). Travel statistics indicate that 17% of resident visitors participated in some sort of outdoor activity during their visit, as did 6% of international visitors. Visitors to state parks and historic sites spent nearly $26 million in 1999. The impact of state parks and historic sites is $63 million per year due to recurring operating expenditures, new construction, and the indirect impact visitor spending has on local economies (LOT, 2004).

In 2003, tourists in Louisiana spent $9.4 billion, even with the post-911 slowdown in the travel industry (LOT, 2004). Approximately $600 million of that spending was for state and local taxes, and $2 billion was for wages and salaries for the 120,000-plus people working directly in the Louisiana travel industry. On September 20, 2005, Louisiana DCRT unveiled Louisiana Rebirth: Restoring the Soul of America, its strategic plan to rebuild Louisiana’s tourism and cultural industries after the destruction inflicted by Hurricanes Katrina and Rita. The fifth guiding principle of the plan states, “We will rebuild to preserve and magnify the awe-inspiring and unique natural resources that make up Louisiana.” (LOT, 2006) Louisiana Rebirth includes many activities and destinations centered around our state parks and historic sites. The DCRT is currently presenting a national advertising campaign designed to invite visitors back to the state and dispel misconceptions about Louisiana as a travel destination. Although not all of Louisiana’s outdoor recreational opportunities are water-based, it can safely be assumed that water quality is a factor in the overall environmental perception of travelers and that outdoor recreation represents an important part of Louisiana's tourism industry. Because water quality often plays an important part in this recreation, it is imperative that it be enhanced and protected.

As can be seen, Louisiana invests a great deal of money in its efforts to enhance and maintain water quality in Louisiana. In return, the citizens of Louisiana and visitors to the state derive a number of benefits, both financial and aesthetic, from the state's abundance of water bodies. With the combined efforts of the LDEQ, industry and, most importantly, the citizens of Louisiana, our waters will continue to provide abundant recreational and commercial benefits for everyone.

PART III: SURFACE WATER MONITOIRNG AND ASSESSMENT

Chapter 1: Surface Water Monitoring Program

The surface water monitoring program of the Office of Environmental Compliance (OEC) and the Office of Environmental Assessment (OEA) of LDEQ is designed to provide data to measure progress toward achieving water quality goals at state and national levels, establish and review the state water quality standards, determine the assimilative capacity of the waters of the state, and establish permit limits for wastewater discharges.

The surface water monitoring program is composed of an ambient water quality monitoring network, intensive surveys, special studies, and wastewater discharge compliance sampling. Some components of the state water monitoring program are briefly described below.

Ambient Water Quality Monitoring Network

LDEQ and its predecessors have maintained a surface water quality monitoring program since the 1950s. Over the years, monitoring stations have been discontinued or added as needs or conditions changed. In January 2004, LDEQ implemented a four-year monitoring schedule (table 3.2.1). Using this schedule nearly all of the 478 water body subsegments are sampled for one "water-year" (October 1 – September 31) during each four-year monitoring cycle, with a different set of approximately 120 subsegments sampled during each water-year. Water quality assessments for the Integrated Report are conducted for all basins every even numbered year as required by the CWA. Water quality monitoring at selected long-term trend sites on larger rivers, bayous, and Lake Pontchartrain will continue irrespective of the four-year monitoring cycle. For a more detailed explanations of the Ambient Water Quality Monitoring Network, refer to Louisiana's *Quality Assurance Project Plan for the Ambient Water Quality Monitoring Network: Revision 3* (LDEQ, 2008a) and Louisiana's *Standard Operating Procedure (SOP) for Water Sample Collection, Preservation, Documentation of Shipping; Sonde Deployment and Continuous Monitoring. SOP1134 R05 (*LDEQ, 2008b).

Fish Tissue Monitoring Activities

With the exception of a statewide mercury study, the Surveillance Division does not maintain a regular fish tissue monitoring program. However, fish are frequently sampled in response to significant complaints, as a result of enforcement actions, or in response to other problems as they occur. Results of tissue analyses are forwarded to the LDEQ and LDHH for statistical and risk assessment analysis. If it is determined there is a need for a health advisory, press releases are prepared for public dissemination of the information.

Intensive Water Quality Surveys

The Water Quality Survey Section within the Surveillance Division (SD) conducts intensive stream surveys to provide physical, chemical, and some biological data necessary to define water quality problems; calibrate and verify mathematical models for development of TMDLs and wasteload allocations (WLAs); and provide additional data for assessments, permitting purposes, the revision of water quality standards, and the development and revision of the state water quality management plan.

Total Maximum Daily Load (TMDL) Status

The Water Quality Assessment Division has focused on TMDL development for water bodies listed on the §303(d) list for low dissolved oxygen, nutrients, and metals and will continue to do so until all water bodies requiring a TMDL have been addressed. Based upon an agreement between LDEQ and USEPA, some TMDLs are developed by USEPA and/or USEPA contractors; these TMDLs are submitted to LDEQ for review. TMDL progress is shown in table 3.1.1.

Table 3.1.1.

Louisiana Department of Environmental Quality Total Maximum Daily Load progress from January 01, 2006 to December 18, 2007.

Subsegment #	Title	Status	Status Date
050601	Lacassine Mill Summary	Final	4/10/2006
080101	A summary of the April 3, 2006 update and calculation of a Graphic Packaging allocation with respect to the Ouachita River flow at Monroe	Final	3/2/2007
100606	Bayou Pierre Watershed TMDL for Biochemical Oxygen-Demanding Substances and Nutrients	Final	4/26/2007
100605	Lake Edwards/Smithport Lake Watershed TMDL for Biochemical Oxygen-Demanding Substances and Nutrients	Final	10/19/2007
101303	Iatt Creek Watershed TMDL for Biochemical Oxygen-Demanding Substances	Final	4/18/2006
101605	Bayou Cocodrie Watershed TMDL for Biochemical Oxygen-Demanding Substances	Final	4/18/2006
120501	Bayou Grand Caillou Watershed TMDL for Biochemical Oxygen-Demanding Substances and Nutrients	Final	4/7/2006
120503	Bayou Petit Caillou TMDL for Biochemical Oxygen-Demanding Substances	Final	1/25/2006
120111	Bayou Maringouin TMDLs for Biochemical Oxygen-Demanding Substances and Nutrients	Final	1/25/2006
120605	Bayou Pointe au Chien TMDL Report	Final	11/7/2006
120104	Bayou Grosse Tete Watershed TMDL for Biochemical Oxygen-Demanding Substances and Nutrients, Including Bayou Portage and Bayou Fordoche	Final	7/6/2007
120507	Bayou Chauvin Watershed TMDL for Biochemical Oxygen-Demanding Substances and Nutrients	Final	8/15/2007
120505	Bayou Du Large Watershed TMDL for Biochemical Oxygen-Demanding Substances and Nutrients	Final	8/15/2007
120201	Lower Grand/Belle River Watershed TMDL for Biochemical Oxygen-Demanding Substances and Nutrients	Final	7/10/2006
060701, 060401	Summary of Modeling for the Iberia Parish Sewerage District No. 1 POTW	Final	4/6/2006
110501	West Anacoco Creek Watershed TMDL For Biochemical Oxygen-Demanding Substances and Nutrients	Pending	11/8/2007

Table 3.1.1.

Louisiana Department of Environmental Quality Total Maximum Daily Load progress from January 01, 2006 to December 18, 2007.

Subsegment #	Title	Status	Status Date
060201	Bayou Cocodrie TMDL for Dissolved Copper	Pending	1/16/2007

Early Warning Organic Compound Detection System

Over 350 industrial and municipal facilities are situated along the Mississippi River within the state of Louisiana. Of these, approximately 175 discharge wastewater into the river under the authority of state and federal permits. These discharges, coupled with the fact that the Mississippi River drains over 40% of the continental U.S., are of great concern to the 1.5 million Louisiana citizens who depend upon the river for their drinking water supply. Because of this concern, the Early Warning Organic Compound Detection System (EWOCDS) was established in 1986. EWOCDS is a cooperative agreement between DEQ, potable water works, and industries along the river. The main objective of this system is to provide warnings of possible contamination of drinking water supplies to interested parties. Secondarily, it provides data concerning the Mississippi River's water quality and helps serve as a deterrent to the surreptitious discharging or spilling of organic wastes into the Mississippi River. Currently, there are eight locations hosted by seven entities along the lower Mississippi River where ambient river water samples are collected and analyzed for the EWOCDS (See Map). Table 3.1.2 lists the 26 compounds analyzed by this program. From January 2006 to December 2007, 6791 samples were collected and analyzed for 26 compounds. Of the samples analyzed, 98% had no compounds detected, and 2% had one or more compounds detected.

Table 3.1.2.

Compounds tested for as part of Louisiana's Early Warning Organic Compounds Detection System.

EWOCDS Acronym	Compound	CAS Number	Drinking Water MCL (ppb)
BDCM	Bromodichloromethane	75-27-4	**
Toluene	Toluene	108-88-3	1000
B-TRI	1,1,2-Trichloroethane	79-00-5	5
PERC	Tetrachloroethene	127-18-4	5
DBCM	Dibromochloromethane	124-48-1	**
CL-Ben	Chlorobenzene	108-90-7	100
Xylene(s)	Dimethylbenzene(s) (m-,o-, and p-Xylenes)	1330-20-7	10,000
PDC	1,2-Dichloropropane	78-87-5	5
BR-3	Bromoform	75-25-2	**
TCE	Trichloroethene	79-01-6	5
M-2	Dichloromethane	75-09-2	5
TV-2	trans-1-2-Dichloroethene	156-60-5	100
CV-2	cis-1-2-Dichloroethene	156-59-2	70
M-3	Chloroform	67-66-3	**
A-TRI	1,1,1-Trichloroethane	71-55-6	200

Table 3.1.2.

Compounds tested for as part of Louisiana's Early Warning Organic Compounds Detection System.

EWOCDS Acronym	Compound	CAS Number	Drinking Water MCL (ppb)
N.A.	1,3-Dichlorobenzene (m-Dichlorobenzene)	N.A.	N.A.
1,4Ben	1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	75
V-2	1-1-Dichloroethene	75-35-4	5
Benzene	Benzene	71-43-2	5
Styrene	Styrene	100-42-5	100
1,2,4-Ben	1,2,4-Trichlorobenzene	120-82-1	70
EDC	1,2-Dichloroethane	107-06-2	5
ET-Ben	Ethylbenzene	100-41-4	700
M-4	Carbon Tetrachloride	56-23-5	5
VC	Vinyl Chloride	75-01-4	2
1,2Ben	1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	600

- Maximum Contaminant Level – MCL
- Parts per billion – ppb
- This list represents the compounds analyzed by EWOCDS since 1 January 2000.
- Maximum contaminant level values listed above are obtained from the USEPA's Safe Drinking Water Act Update March 2004. For more information see Drinking Water Regulations on USEPA's web site: http://www.epa.gov/safewater/mcl.html

**These compounds are trihalomethanes and are regulated in drinking water at a maximum combined total of 80 ppb.

Chapter 2: Assessment Method and Summary Data/Integrated Report Rationale

Introduction

This summary of Louisiana's water quality assessment methods and Integrated Report (IR) development procedures is taken from the IR Rationale submitted to USEPA in support of Louisiana's 2008 IR. The IR is developed in order to meet reporting requirements of the Federal Water Pollution Control Act (33 U.S.C. §1313 and 40 CFR Chapter 1 §130.7), commonly known as the Clean Water Act (CWA) (Federal Water Pollution Control Act (FWPCA), 1987). Specifically, assessment results for this IR satisfy requirements of §303(d) and §305(b) of the CWA. Reports under §303(d) and §305(b) must be prepared every even-numbered year. Following current USEPA guidance, these two reports are now combined into one Integrated Report. This rationale includes descriptions of changes made to Louisiana's IR since the 2006 cycle, along with the reasoning behind those changes. Changes to the IR for 2008 are based on new ambient water quality data collected from 1 January 2004 through 30 October 2007. During the 2005 ambient monitoring rotation, there was little ambient sampling occurring in the area affected by Hurricane Katrina; therefore, the period from 29 August 2005 when Hurricane Katrina came ashore and 23 September 2005 when Hurricane Rita came ashore did not include any sampling from the area affected by Katrina. In addition, due to rapidly shifting priorities following Hurricanes Katrina and Rita, little or no ambient monitoring was conducted statewide. All ambient data collected following Hurricanes Katrina and Rita that was suspected of being impacted by post-hurricane conditions was "flagged" in the database and not used for ambient water quality assessments.

Section 303(d) of the CWA requires the identification, listing, and ranking for development of Total Maximum Daily Loads (TMDLs) for waters that do not meet applicable water quality standards after implementation of technology-based controls. Section 305(b) of the CWA requires, among other items, a description of all navigable waters in each state and the extent to which these waters provide for the protection and propagation of fish and wildlife and allow for recreational activities in and on the water (33 U.S.C. §1315(b) et seq.) All assessments were prepared using existing and readily available water quality data and information in order to comply with rules and regulations under §303(d) of the Act (33 U.S.C. §1313 and 40 CFR Chapter 1 §130.7). In most cases, water quality assessments and possible §303(d) listing are based on specific water body subsegments as defined in LAC 33:IX.1123, table 3 (LAC, 2008). Additional data and information were solicited during a 30-day data request public notice period which ended 4 December 2007. A second 30-day data request period, targeted to additional state and federal agencies, was initiated on 4 December 2007 and ended 2 January 2007. Additional data was provided by the Sabine River Authority, Lake Pontchartrain Basin Foundation, and USEPA Region 6. This data was considered in conjunction with ambient water quality data collected by LDEQ.

The 2008 IR contains new assessments for subsegments in all twelve Louisiana basins: Atchafalaya (01), Barataria (02), Calcasieu (03), Pontchartrain (04), Mermentau (05), Vermilion/Teche (06), Mississippi (07), Ouachita (08), Pearl (09), Red (10), Sabine (11), and Terrebonne (12). Louisiana's water quality monitoring and assessment program follows the four-year rotating basin approach shown in table 3.2.1. For the 2007 monitoring cycle, LDEQ changed from a calendar year rotation to a "water-year" rotation of October 1st – September 31st. This permits a full twelve months of water quality data to be collected in sufficient time to generate the Integrated Report by April 1st of even-numbered years.

LDEQ's four-year rotation monitoring program has a number of benefits over previous monitoring programs:

1. Water quality data from the same number of water bodies was collected over a shorter period of time, thus improving LDEQ's ability to identify and target newly developing problems in a timely manner.
2. Samples were collected statewide instead of in two or three basins per year, enabling LDEQ to monitor water quality issues on a broader regional scale.
3. Regional staff responsible for collection of samples remained skilled and up-to-date on the latest sampling procedures.
4. Regional staffs were able to balance their workloads more evenly instead of having two or three years in which they do little or no ambient water quality sampling and one year of intense field sampling at the expense of all other work.

Table 3.2.1.

Monitoring and assessment schedule for Louisiana's four-year rotating basin plan.

Basin	First Monitoring Rotation	Second Monitoring Rotation
Atchafalaya Basin (01)	2004, 2005	1.
Barataria Basin (02)	2004, 2005	1.
Calcasieu River Basin (03)	2004, 2005	1.
Lake Pontchartrain Basin (04)	2006, 2007	1.
Mermentau River Basin (05)	2004, 2005, 2006, 2007	1.
Vermilion-Teche River Basin (06)	2004, 2005, 2006, 2007	1.
Mississippi River Basin (07)	2004, 2005	1.
Ouachita River Basin (08)	2004, 2005	1.
Pearl River Basin(09)	2006, 2007	1.
Red River Basin (10)	2004, 2005, 2006, 2007	1.
Sabine River Basin (11)	2006, 2007	1.
Terrebonne Basin (12)	2004, 2005	1.

1. All subsegments will be sampled for one year (October 1 – September 31) at some point in time during the four year rotation.

2008 Water Quality Assessment Procedures

General Assessment Procedures

Assessment procedures used for Louisiana's 2008 IR have been developed and updated over a number of years for use in this and previous §305(b) reports. Procedures follow USEPA guidance documents for §305(b) reports and

§303(d) lists (USEPA, 2005), USEPA's Consolidated Assessment and Listing Methodology (CALM) guidance (USEPA, 2002), as well as Louisiana's surface water quality standards found at LAC 33:IX.1101-1123. Assessment procedures remain largely the same as were used for the 2006 IR. Additional details of Louisiana's Integrated Report assessment process can be found in Louisiana's *Standard Operating Procedures for Production of Water Quality Integrated Report. Revision 2.* (LDEQ, 2007). Deviations from previous procedures will be noted in the following description of assessment processes.

For the 2008 IR assessment, field staff collected monthly field analysis and laboratory samples. Laboratory samples were sent to LDEQ's water laboratory in Baton Rouge (conventional parameters), one of several LDHH laboratories (fecal coliform bacteria), or a contract lab (metals). In order for water quality or other related data to be utilized for §305(b) reporting and §303(d) listing, sample collection, handling, and laboratory analysis must be in accordance with LDEQ's Quality Assurance Project Plan developed by LDEQ and approved by USEPA Region 6. Data from the LDEQ laboratory as well as field data were entered into LIMS (Laboratory Information Management System) by laboratory staff. After electronic data deliverables from the laboratory were received, these data were electronically entered into the Oracle-based Louisiana Environmental Assessment Utility (L'EAU) database, maintained on a central LDEQ server by the Standards, Assessment and Nonpoint Source Section (SAN), Water Quality Assessment Division (WQAD), Office of Environmental Assessment (OEA). Data from LDHH and the contract laboratory were also entered into L'EAU by SAN staff. Field parameter results measured using water quality instrumentation were entered by hand from field data sheets completed by regional LDEQ personnel responsible for ambient water quality sampling. All ambient water quality data used for this assessment can be obtained by following directions found on the LDEQ web site at: http://www.deq.louisiana.gov/portal/Default.aspx?tabid=2421. In addition to water quality data collected by LDEQ, additional data and information were solicited from the public and other state and federal agencies.

At the beginning of this assessment cycle, L'EAU and Statistical Analysis Software (SAS) programs were reviewed and updated as necessary to reflect changes in time frame, subsegments assessed, criteria, and assessment methods. A series of L'EAU data queries was run and the resulting data transferred to a series of SAS statistical programs. SAS programs are utilized to compare ambient numerical data to criteria for each water body subsegment and designated use. Louisiana Water Quality Standards define eight designated uses for surface waters: primary contact recreation (PCR), secondary contact recreation (SCR), fish and wildlife propagation (FWP), drinking water supply (DWS), shellfish propagation (SFP), agriculture (AGR), outstanding natural resource (ONR), and limited aquatic and wildlife use (LAW). Designated uses and criteria for each water body subsegment are listed in Louisiana's LAC 33:IX.1123. Designated uses have a specific suite of ambient water quality parameters used to assess their support. Links between designated uses and water quality parameters, as well as water quality assessment procedures, can be found in table 3.2.2. Data and information collected from within or immediately downstream of a water body subsegment were used to evaluate each of the subsegment's designated uses, using the decision process shown in table 3.2.2. Where more than one parameter and criterion define a designated use, support for each use was defined by the designated use's poorest performing parameter (most severely impaired). In rare cases where data from more than one sample station were available for the same subsegment, a case-specific determination was made as to how to use the data.

To illustrate this point, most water bodies have the designated use of FWP. Fish and wildlife propagation is assessed, as noted in table 3.2.2, using criteria for the ambient sampling parameters dissolved oxygen, pH, temperature, chloride, sulfate, and TDS, as well as several metals and organic compounds. In the case of subsegment LA030302_00, Lake Charles, only the FWP criterion for dissolved oxygen was not met based on requirements of table 3.2.2. Therefore, only dissolved oxygen was reported as an impairment to FWP in the 2008 IR. Had turbidity or some other parameter also shown impairment, that impairment would have been listed as well.

Table 3.2.2.

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2008 Integrated Report* (see footnote 6).

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	Partially Supporting[2]	Not Supporting
Primary Contact Recreation (PCR) (Designated swimming months of May-October, only.)	Fecal coliform[1]	0-25% do not meet criteria	-	>25% do not meet criteria
	Temperature	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
	Toxics	< 2 exceedances of chronic or acute criteria in most recent consecutive 3-year period,[5] or 1-year period for newly tested waters	-	≥2 exceedances of chronic or acute criteria in most recent consecutive 3-year period,[5] or 1-year period for newly tested waters
Secondary Contact Recreation (SCR) (All months)	Fecal coliform[1]	0-25% do not meet criteria	-	>25 % do not meet criteria
	Toxics	< 2 exceedances of chronic or acute criteria in most recent consecutive 3-year period,[5] or 1-year period for newly tested waters	-	≥2 exceedances of chronic or acute criteria in most recent consecutive 3-year period,[5] or 1-year period for newly tested waters

Table 3.2.2.

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2008 Integrated Report* (see footnote 6).

Designated Use	Measured Parameter	Support Classification for Measured Parameter Fully Supporting	Partially Supporting[2]	Not Supporting
Fish and Wildlife Propagation (FWP)	Dissolved oxygen (routine ambient monitoring data)[3]	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria
	Dissolved oxygen (follow-up continuous monitoring data)[3]	Footnote 3.	Footnote 3.	Footnote 3.
	Temperature, pH, chloride, sulfate, TDS, turbidity	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
	Metals[4] and Toxics	< 2 exceedances of chronic or acute criteria in most recent consecutive 3-year period,[5] or 1-year period for newly tested waters	-	$\geq$2 or more exceedances of chronic or acute criteria in most recent consecutive 3-year period,[5] or 1-year period for newly tested waters
Drinking Water Source (DWS)	Color,	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
	Fecal coliform[1]	0-30% do not meet criteria	-	>30 % do not meet criteria
	Metals[4] and Toxics	< 2 exceedances of drinking water criteria in most recent consecutive 3-year period,[5] or 1-year period for newly tested waters	-	$\geq$2 or more exceedances of drinking water criteria in the most recent consecutive 3-year period,[5] or 1-year period for newly tested waters
Outstanding Natural Resource (ONR)	Turbidity	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria
Agriculture (AGR)	None	-	-	-
Oyster Propagation (SFP)	Fecal coliform[1]	$\leq$ 10% of samples $\leq$ 43 MPN/100 mL	-	> 10% of samples > 43 MPN/100 mL
Limited Aquatic and Wildlife (LAW)	Dissolved oxygen[3]	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria

Table 3.2.2.

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2008 Integrated Report* (see footnote 6).

Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	Partially Supporting[2]	Not Supporting

1. For most water bodies, criteria are as follows: PCR, 400 colonies/100 mL; SCR, 2,000 colonies/100 mL; DWS, 2,000 colonies/100 mL; SFP, 43 colonies/100 mL (see LAC 33:IX.1123).
2. While the assessment category of "Partially Supporting" is included in the SAS statistical assessment programming, any use support failures were recorded in ADB as "Not Supporting." This procedure was first adopted for the 2002 §305(b) cycle because "partially supported" uses receive the same TMDL treatment as "not supported" uses.
3. In the event that analysis of routine ambient monitoring data for dissolved oxygen results in partial- or non-support, continuous monitoring (CM) data, where available, was used for follow-up assessment. CM data was evaluated as follows: All of the 15-minute interval dissolved oxygen observations were analyzed to determine if more than 10% of the data points were below minimum criteria. Water bodies that fell below the criteria greater than 10% of the time were reported as IRC 5 and, therefore, are on the §303(d) list. Water bodies that fell below the criteria less than or equal to 10% of the time were placed in IRC 1, fully supported. If ambient monitoring indicated impairment and CM data was not available for analysis, the water body was placed in IRC 5 until such time as CM data can be collected during the critical season of May 1 through October 31.
4. Determination of the application of marine or freshwater metals criteria was made based on LAC 33:IX.1113.A.C.6.d.
5. For the 2008 Integrated Report, data for some subsegment assessments was collected in the first year, 2004, of the four-year rotating basin monitoring program. Because of this four-year rotation, metals and toxics data from this first year was included for assessment even though it is outside the normal three-year period for metals and toxics assessments. This ensures that new metals and toxics assessments were developed for subsegments monitored in the first year of the four-year rotation.
6. Where deviations from the decision process described in table 3.2.2 occur, detailed information will be given to account for and justify those deviations. For instance, circumstances that may not be accounted for in the plain electronic analysis of the data will be explored and may be used to either not list the water body or to put the WIC into a different category. Those circumstances will be fully articulated.
7. In the event that a metals impairment (two or more samples above criterion) was identified using ambient metals sampling, five clean-technique metals samples were collected and analyzed using a contract clean metals laboratory. If two or more of these five samples were above the criterion then the subsegment was placed in IRC 5 for that metal. If clean-technique metals data was not available, then the subsegment was reported as IRC 5. If no or one clean-technique sample result was above the criterion then the subsegment was not reported as impaired for that metal (LAC 33:IX.1113.C.6.f).

Numerical data from LDEQ's ambient water quality monitoring network collected between 1 January 2004 and 30 October 2007 were compiled for each assessment. Under Louisiana's four-year rotating basins monitoring approach, this provided twelve monthly samples for most water body subsegments. Up to four years (48 samples) of data were available for those subsegments with long-term trend monitoring sites. For most parameters and criteria, at least five samples were required for the assessment to be considered valid. Parameters collected quarterly (metals and organics) required a minimum of three samples. Ambient data used for analysis depended on the designated use(s) for each water body and the availability of numerical water quality criteria.

Following statistical determination of a water body's designated use support and what chemical parameters in that water body may be impaired, a preliminary determination was made as to which Integrated Report Category (IRC) the suspected water body impairment combination (WIC) should be placed in. A WIC is simply one impairment affecting one water body subsegment. For example, low dissolved oxygen, an impairment on subsegment LA030302_00, Lake Charles, is one WIC. In this case the WIC is an impairment to the designated use of FWP. In addition to this impairment, Lake Charles is also affected by the WIC of fecal coliform impairing the designated use of PCR. USEPA guidance permits the placement of suspected WICs into one of seven IR categories. Integrated Report Categories, to which these WICs may be assigned, are described in table 3.2.3.

Nutrient Assessment Procedures

While water quality data is collected for nitrogen and phosphorus, numerical criteria have not yet been established for these nutrients. Therefore, direct numerical assessment of nutrients could not be conducted on those water bodies suspected of having nutrient impairments. However, based on the established connection between nutrient and dissolved oxygen (DO) concentrations LDEQ determined to use DO assessment results as an indicator of narrative nutrient criteria support. This was done in order to address the large number of nutrient related WICs in previous Integrated Reports. LDEQ and U.S. EPA commonly develop TMDLs for the reduction of biological oxygen demand (BOD) in order to address conditions of low DO in water bodies. This reduction in BOD is directed at the reduction of nutrients. Based on this TMDL protocol, if the DO criterion is found to be fully supported then nutrients are assumed to be at levels that preclude impairment of the water body. Likewise, if the DO criterion is found to be not supported then nutrients *may* be one of the suspected causes of the impairment. Therefore, if a specific nutrient (nitrogen, phosphorus, ammonia) was previously listed on the §303(d) list then these listings were included on the 2008 IR. If only the general category of nutrients was listed on previous §303(d) lists, then the ADB impairment classifications of "nitrate/nitrite nitrogen" and "total phosphorus" were included on the 2008 IR. If nutrients were not listed on previous §303(d) lists, but DO was found to be impaired, only DO was included on the 2008 IR. In this case, as noted above nutrients will still be addressed through a DO TMDL.

The legal status for this position is based on a ruling in a lawsuit regarding water quality criteria for nutrients (Sierra Club v. Givens, 710 So.2d 249 (La. App. 1st Cir. 1997), writ denied, 705 So.2d 1106 (La. 1998). U.S. EPA supports LDEQ's position as shown in their report, *Tensas River TMDLs for Dissolved Oxygen and Nutrients* (May 28, 2002) where they stated,

> In addition, LDEQ issued a declaratory ruling on April 29, 1996, concerning this language and stated, "(that) DO directly correlates with overall nutrient impact is a well-established biological and ecological principle (U.S. EPA Region 6. 2002). Thus, when the LDEQ maintains and protects DO, the LDEQ is in effect also limiting and controlling nutrient concentrations and impacts." DO serves as the indicator for the water quality criteria and for assessment of use support. For the TMDLs in this report, the nutrient loading required to maintain the DO standard is the nutrient TMDL.

Determination of Suspected Sources of Impairment

In addition to the use of numerical data, LDEQ regional staff were asked for input regarding significant suspected sources of impairment or whether impairment was due solely to natural sources. It was anticipated that numerical data alone might suggest impairment for some Louisiana water bodies when in fact there was no impairment, or the impairment was due exclusively to natural causes. In all cases, regional staff familiar with the area would be able to suggest one or more suspected sources for a water body's impairment. Using the best professional judgment of regional staff provides valuable input regarding the quality of individual water bodies.

Data Management of Assessment Results

All resulting assessment information, including water body name, size, type, designated uses, use support, suspected causes, and suspected sources of impairment, was entered into a database developed for the USEPA by RTI. (Formerly known as Research Triangle Institute, RTI is a USEPA contractor for computer technology.) States are encouraged by USEPA to use this Assessment Database (ADB) in order to provide more consistent reporting at a national level. LDEQ has been using ADB since 2002. For 2008, the IRC for each WIC was included in the "User Defined Category" field of the "Cause" data entry screen. Additional information regarding each water body, including TMDL due date, TMDL status, monitoring information, and federal Hydrologic Unit Code (HUC), can also be input to ADB. Due to time limitations during this reporting cycle, this additional information has not yet been consistently recorded in ADB for all water bodies; however, all required information for the IR and water quality assessment process has been included. LDEQ hopes to add the remainder of this ancillary information to the ADB system following completion of the 2008 IR in order to facilitate easier monitoring, assessment, and TMDL tracking.

2008 §303(d) List Development and Other IR Categorizations

The 2008 §303(d) list represents a compilation of four different sources of information:

- The 2006 Integrated Report
- New data assessments for all twelve Louisiana basins
- All recent TMDL activities occurring during or after development of the 2006 §303(d) list
- All water bodies under new or existing fish consumption or swimming advisories

In addition to drawing from these various sources and assigning IRCs to the suspected causes of impairment, USEPA's current guidance on IR development was used to determine what water bodies were formally included on Louisiana's 2008 list (IRC 5 and IRC 5RC). Using USEPA's IR guidance, all suspected WICs identified in the 2008 IR were assigned to one of eight categories (table 3.2.3).

Table 3.2.3.

U.S. Environmental Protection Agency and Louisiana Department of Environmental Quality Integrated Report categories used to categorize water body/pollutant combinations for Louisiana's 2008 Integrated Report.

IR Category (IRC)	IR Category Description
IRC 1	Specific Water body Impairment Combination (WIC) cited on a *previous* §303(d) list is now attaining all uses and standards.
IRC 2	Water body is meeting *some* uses and standards but there is insufficient data to determine if uses and standards *associated with the specific WIC* cited are being attained.
IRC 3	There is insufficient data to determine if uses and standards *associated with the specific WIC* cited are being attained.
IRC 4a	WIC exists but a TMDL has been completed for the *specific WIC* cited.
IRC 4b	WIC exists but control measures other than a TMDL are expected to result in attainment of designated uses *associated with the specific WIC* cited.
IRC 4c	WIC exists but a pollutant (man-altered or man-induced impairment) does not cause the *specific WIC* cited.
IRC 5	WIC exists for one or more uses, and a TMDL is required for the *specific W*IC cited. IRC 5 represents Louisiana's §303(d) list.
IRC 5RC (Revise Criteria)	WIC exists for one or more uses, and a TMDL is required for the specific WIC cited; however, LDEQ will investigate revising criteria due to the possibility that natural conditions may be the source of the water quality criteria impairments. IRC 5RC is also a part of Louisiana's §303(d) list.

It is important to note that removal of a water body from the §303(d) list (IRC 5 and IRC 5RC), for any reason, does not remove water quality protections from that water body. All water bodies in Louisiana, listed or not listed, are subject to the same protections under the CWA and Louisiana's Environmental Quality Act (LEQA) (LEQA, 1995). Permitted facilities are still subject to conditions of their permits. Unpermitted point source dischargers are still required to obtain a permit or face enforcement actions. Violators of permit conditions are still subject to enforcement action. And, contributors to nonpoint sources of pollution are still encouraged to follow best management practices as developed by LDEQ's Nonpoint Source Program and its many collaborators. Dischargers to water bodies removed from the §303(d) list because TMDLs have been developed are still required to meet permit limits based on the TMDL that was developed for that water body.

USEPA's IR guidance was used to categorize specific suspected WICs in order to narrow the focus on which impairments require development of a TMDL for each assessed water body subsegment. If necessary, suspected WICs placed in IRC 3, 4b, or 5RC will be addressed with additional monitoring to determine if use impairment is occurring, or if the suspected impairment can be addressed by corrective actions other than development of a TMDL. In some cases, usually related to fish consumption or swimming advisories on small water bodies lying within a larger regulatory subsegment, the smaller "advisory" water body was also named in the 2008 IR. Impairments of this nature are water body-specific issues not directly related to the overall subsegment. These smaller water bodies are not named as a regulatory subsegment and, therefore, were not assessed for any uses other than the specific advisory in question. In order to maintain a baseline set of assessed subsegments for IR summary purposes, these "advisory" water bodies are not included when developing summary tables and charts. Baseline assessment subsegments consist of those water body subsegments found in Louisiana's water quality regulations (LAC 33:IX.1123. Table 3).

Use of IRC 1-4c by Louisiana is not meant to imply that a water body subsegment placed in these categories for specific WICs was explicitly excluded from IRC 5 (the 303(d) list). To the contrary, a water body with one or more specific WICs assigned to an IRC of 1-4c was included in IRC 5 as well, provided one or more WICs for that water body have been placed in IRC 5. Therefore, according to USEPA IR guidance, water bodies with one or more WICs assigned to IRC 5 are explicitly on the §303(d) list. However, these water bodies are only on the §303(d) list for WICs assigned by Louisiana specifically to IRC 5 and IRC 5RC. IR Categories 1-4c were also used by Louisiana in its Integrated Report as a means to classify and account for WICs found on USEPA's Consent Decree §303(d) list.

These categories were also used to account for newly identified impairments, not assigned to IRC 5 or IRC 5RC, that are caused by natural sources or for which control activities other than TMDLs are in place.

Delisting of Categorical Impairments from Appendix B-IR Addendum

Due to technical limitations in USEPA's Assessment Database (ADB) certain historical impairments reported in previous §305(b) reports and §303(d) lists as broad categories i.e. "pesticides," "unknown toxicity," "priority organics," and "nonpriority organics" cannot be tracked in ADB. These categorical suspected sources of impairment were originally added to Louisiana's §305(b) reports as "evaluative assessments." The assessments were made as best professional judgment by LDEQ regional staff responsible for water quality sampling, inspections and complaint investigations. In many cases these assessments were made in the absence of any specific water quality data indicating exceedances of regulatory criteria. As such, it is rarely possible to determine what, if any, specific compound the field staff had in mind when these assessments were first made. The process of using evaluative assessments was discontinued for the 2000 §305(b) report. Since that time a continuing effort has been made to locate and evaluate suitable data to confirm or reject the earlier evaluative assessments.

Beginning with the 2006 IR these categorical impairments were placed in Appendix B-Addendum since they cannot be included in ADB. This section of the 2008 IR reports on efforts to delist some of these impairments using new water quality data collected during the past six years.

<u>Priority Organics, Non-Priority Organics, and Unknown Toxicity</u>

In order to develop these delistings organic compound data was downloaded from L'EAU for a six year period dating from 1 January 2002 through 14 January 2008. The subsegments investigated were as follows: LA020402, LA040908, LA0401202, LA100605, LA120106, LA120402, LA120403, LA120509, LA120601, LA120603, LA120604, LA120605, LA120703, LA120704, and LA120707. Water quality data were compared to LDEQ's toxics pollutant criteria listed in the Environmental Regulatory Code at LAC 33:IX.1113.C.6, table 1. USEPA's national drinking water recommendation for methyl-t-butyl ether (MTBE) was used in lieu of LDEQ criteria. This recommendation can be found at: http://www.epa.gov/safewater/contaminants/unregulated/mtbe.html.

Seven of fifteen subsegments investigated had no detections of organic compounds: these included LA020402, LA040908, LA120106, LA120403, LA120703, LA120704, and LA120707. All seven of these subsegments can, therefore, be delisted from the 2008 IR, addendum, for priority organics. Of the eight remaining subsegments with detectable concentrations, none of the organics with documented criteria had concentrations exceeding criteria or the USEPA recommended drinking water value. The organic compounds found at detectable concentrations in these subsegments were:

- chloromethane (Louisiana criterion)
- toluene (Louisiana criterion)
- bromoform (Louisiana criterion)
- dibromochloromethane (Louisiana criterion)
- methyl tertiary-butyl ether (MTBE) (USEPA drinking water recommendation)

Chloromethane was found below criterion in LA041202, LA120402, LA120604, and LA120605. Toluene was found below criterion in LA120509. Bromoform and dibromochloromethane were both detected one time at concentrations below the criteria in LA100605. MTBE, which has a USEPA recommended drinking water value of 20-40 ug/L (not a criterion), was found to be below the USEPA recommended value in LA120601 and LA120603.

In summary, based on the data obtained from L'EAU and using LDEQ or USEPA drinking water recommended values, all fourteen subsegments originally assessed for organic compounds are being delisted, removed from IR category 5, for priority organics impairments for the 2008 Integrated Report. These fourteen include LA020402, LA040908, LA041202, LA120106, LA120402, LA120403, LA120509, LA120601, LA120603, LA120604, LA120605, LA120703, LA120704, and LA120707.

Based on the full support for priority organics criteria analyzed, subsegment LA041202 will also be delisted for non-priority organics and "other inorganics." This delisting is also based in part on a planned remediation activity, which will cap and sequester any remaining sediment contaminants. In addition to the priority organics delisting, subsegment LA100605 will also be delisted for "unknown toxicity" based on the absence of priority organic compounds or detections above applicable criteria. The 2008 Integrated Report metals assessment for LA100605 was fully supporting for all metals tested. Subsegment LA120106 will be delisted for non-priority organics based on the analysis for priority organics cited above during which no priority organics were detected. An Excel spreadsheet containing supporting priority organics water quality data and associated criteria is available for review upon request.

Pesticides

Subsegment LA120101, Bayou Portage, was previously listed for "pesticides" in the 2006 IR Addendum. Due to recent changes in Louisiana's LAC 33:IX.1113.C.6, table 1, this subsegment was combined into the larger subsegment LA120104. Subsegment LA120104 was delisted for Atrazine during a previous IR assessment cycle. Therefore, LA120101 is no longer considered impaired for Atrazine and can be removed from the 2008 IR Addendum and IR category 5.

Conclusion

Due to the extensive nature of documentation used to assess water quality in Louisiana, it was impossible to provide all the data or information used in preparation of this 2008 IR. Anyone interested in viewing this documentation, or anyone with questions regarding the 2008 Integrated Report is asked to contact Mr. Albert E. Hindrichs at:

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Chapter 3: River and Stream Water Quality Assessment

Summary of River and Stream Water Quality Assessments

The figures reported in table 3.3.1 are based upon the level of use support for all applicable designated uses, as determined through monitored assessments. The miles of impaired water bodies identified as being affected by various suspected causes of impairment are shown in table 3.3.2. The miles affected by various suspected sources of impairment are shown in table 3.3.3. Tables 3.3.2 and 3.3.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, table 3, can be found in Appendices A, B, and C.

Table 3.3.1.

Summary of designated use support for Louisiana rivers and streams, *2008 Integrated Report* assessment. (Reported in miles (water body count).)

Designated Use	Size Fully Supporting		Size Not Supporting		Insufficient Data		Not Assessed		Total Size for Designated Use	
Primary Contact Recreation	7,398	(254)	1,636	(66)	76	(2)	70	(10)	9,179	(332)
Secondary Contact Recreation	9,017	(319)	239	(13)	0		88	(12)	9,344	(344)
Fish and Wildlife Propagation	2,515	(89)	6,679	(243)	0		67	(7)	9,262	(339)
Drinking Water Supply	1,050	(19)	426	(10)	0		12	(1)	1,488	(30)
Outstanding Natural Resource Waters	995	(35)	582	(23)	0		10	(3)	1,587	(61)
Oyster Propagation	264	(18)	206	(11)	0		0		470	(29)
Agriculture	1,719	(48)	0		0		325	(12)	2,044	(60)
Limited Aquatic Life and Wildlife Use	19	(2)	63	(3)	0		0		82	(5)

<u>**Suspected Causes of Non-Support of Designated Uses**</u>

Table 3.3.2.

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected causes of impairment, *2008 Integrated Report*. (Reported in miles and water body count.)

Suspected Cause of Impairment	Size	Count
1,1,1,2-Tetrachloroethane	12	1
1,2-Dichloroethane	8	1
Ammonia (Total)	120	5
Atrazine	43	1
Benzo(a)pyrene (PAHs)	13	2
Bromoform	12	1
Carbofuran	930	23
Chloride	366	25
Chlorine	6	1
Color	426	10
DDT	749	6
Dioxin (including 2,3,7,8-TCDD)	70	2
Fecal Coliform	1,836	75

Table 3.3.2.

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected causes of impairment, *2008 Integrated Report*. (Reported in miles and water body count.)

Suspected Cause of Impairment	Size	Count
Fipronil	252	6
Hexachlorobenzene	12	1
Hexachlorobutadiene	12	1
Lead	378	12
Mercury	2,391	73
Methoxychlor	8	1
Methyl Parathion	43	1
Nitrate/Nitrite (Nitrite + Nitrate as N)	1,328	52
Non-Native Aquatic Plants	493	26
Oil and Grease	4	1
Oxygen, Dissolved	5,018	178
pH, High	7	1
pH, Low	553	23
Phenols	8	1
Phosphorus (Total)	1,264	50
Polychlorinated biphenyls	41	3
Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems)	29	2
Sedimentation/Siltation	1,130	31
Sulfates	791	33
Total Dissolved Solids	1,374	59
Total Suspended Solids (TSS)	1,793	45
Toxaphene	420	2
Turbidity	2,235	62

<u>Suspected Sources of Non-Support of Designated Uses</u>

Table 3.3.3.

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected sources of impairment, *2008 Integrated Report*. (Reported in miles and water body count.)

Suspected Sources of Impairment	Size	Count
Agriculture	721	20
Atmospheric Deposition - Toxics	2,391	73
CERCLA NPL (Superfund) Sites	13	2
Changes in Tidal Circulation/Flushing	59	5
Combined Sewer Overflows	39	2
Contaminated Sediments	13	2
Crop Production (Crop Land or Dry Land)	652	6
Dairies (Outside Milk Parlor Areas)	10	1
Discharges from Municipal Separate Storm Sewer Systems (MS4)	139	9
Drainage/Filling/Loss of Wetlands	321	17
Dredging (e.g., for Navigation Channels)	40	1

Table 3.3.3.

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected sources of impairment, *2008 Integrated Report*. (Reported in miles and water body count.)

Suspected Sources of Impairment	Size	Count
Drought-related Impacts	124	6
Flow Alterations from Water Diversions	166	7
Forced Drainage Pumping	83	7
Habitat Modification - other than Hydromodification	127	10
Impacts from Hydrostructure Flow Regulation/modification	146	6
Industrial Land Treatment	34	2
Industrial Point Source Discharge	160	9
Industrial/Commercial Site Stormwater Discharge (Permitted)	72	3
Introduction of Non-native Organisms (Accidental or Intentional)	510	28
Irrigated Crop Production	1,863	46
Littoral/shore Area Modifications (Non-riverine)	127	10
Livestock (Grazing or Feeding Operations)	183	6
Managed Pasture Grazing	186	6
Marina/Boating Sanitary On-vessel Discharges	90	6
Mine Tailings	30	1
Municipal (Urbanized High Density Area)	156	6
Municipal Point Source Discharges	488	24
Natural Conditions - Water Quality Standards Use Attainability Analyses Needed	1,638	65
Natural Sources	1,502	50
Naturally Occurring Organic Acids	327	14
Non-irrigated Crop Production	1,706	46
Non-Point Source	197	6
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	1,086	50
Other Spill Related Impacts	22	1
Package Plant or Other Permitted Small Flows Discharges	436	23
Petroleum/natural Gas Activities	53	2
Rangeland Grazing	58	2
Residential Districts	86	3
Runoff from Forest/Grassland/Parkland	63	2
Rural (Residential Areas)	169	6
Sanitary Sewer Overflows (Collection System Failures)	386	14
Seafood Processing Operations	12	1
Sediment Resuspension (Clean Sediment)	167	6
Sewage Discharges in Unsewered Areas	314	15
Silviculture Activities	257	7
Silviculture Harvesting	121	3
Silviculture Plantation Management	276	8
Site Clearance (Land Development or Redevelopment)	186	12
Source Unknown	3,950	140
Sources Outside State Jurisdiction or Borders	409	6
Streambank Modifications/destabilization	10	1

Table 3.3.3.

Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected sources of impairment, *2008 Integrated Report*. (Reported in miles and water body count.)

Suspected Sources of Impairment	**Size**	**Count**
Total Retention Domestic Sewage Lagoons	86	8
Transfer of Water from an Outside Watershed	72	3
Unpermitted Discharge (Domestic Wastes)	268	10
Unspecified Domestic Waste	39	3
Unspecified Land Disturbance	37	1
Unspecified Urban Stormwater	42	3
Upstream Source	48	3
Urban Runoff/Storm Sewers	14	2
Waterfowl	22	1
Wildlife Other than Waterfowl	393	15

Chapter 4: Lake Water Quality Assessment

Summary of Lake Water Quality Assessments

The figures reported in table 3.4.1 are based upon the level of use support for all applicable designated uses, as determined through monitored assessments. The acres of impaired water bodies identified as being affected by various suspected causes of impairment are shown in table 3.4.2. The acres affected by various suspected sources of impairment are shown in table 3.4.3. Tables 3.4.2 and 3.4.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, table 3, can be found in Appendices A, B, and C.

Table 3.4.1.

Summary of designated use support for Louisiana lakes, *2008 Integrated Report* assessment. (Reported in acres (water body count).)

Designated Use	Size Fully Supporting		Size Not Supporting		Insufficient Data		Not Assessed		Total Size for Designated Use	
Primary Contact Recreation	619,129	(55)	38,039	(6)	832	(1)	2,322	(4)	660,322	(66)
Secondary Contact Recreation	631,120	(61)	26,880	(1)	0		2,322	(4)	660,322	(66)
Fish and Wildlife Propagation	22,921	(10)	635,079	(52)	0		2,322	(4)	660,322	(66)
Drinking Water Supply	249,027	(9)	2,690	(1)	12,909	(1)	38	(1)	264,664	(12)
Agriculture	425,672	(15)	0		0		326	(1)	425,998	(16)

<u>Suspected Causes of Non-Support of Designated Uses</u>

Table 3.4.2.

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected causes of impairment, *2008 Integrated Report*. (Reported in acres and water body count.)

Suspected Cause of Impairment	Size	Count
Ammonia (Total)	6,099	1
Arsenic	24	1
Carbofuran	83,840	1
Chloride	51,840	1
Color	2,690	1
Fecal Coliform	36,292	5
Hexachlorobenzene	24	1
Hexachlorobutadiene	24	1
Lead	1,771	2
Mercury	318,481	20
Nitrate/Nitrite (Nitrite + Nitrate as N)	24,259	9
Non-Native Aquatic Plants	319,163	16
Oil and Grease	24	1
Oxygen, Dissolved	194,002	33
pH, High	29,548	5
pH, Low	8,243	5

Table 3.4.2.

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected causes of impairment, *2008 Integrated Report*. (Reported in acres and water body count.)

Suspected Cause of Impairment	Size	Count
Phosphorus (Total)	24,259	9
Polychlorinated biphenyls	2,260	3
Sedimentation/Siltation	153,472	4
Sulfates	66,999	3
Temperature, water	1,747	1
Total Dissolved Solids	63,276	3
Total Suspended Solids (TSS)	154,717	6
Turbidity	256,578	15

Suspected Sources of Non-Support of Designated Uses

Table 3.4.3.

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected sources of impairment, *2008 Integrated Report*. (Reported in acres and water body count.)

Suspected Sources of Impairment	Size	Count
Agriculture	44,007	6
Atmospheric Deposition - Toxics	318,457	19
Contaminated Sediments	24	1
Crop Production (Crop Land or Dry Land)	154	1
Discharges from Municipal Separate Storm Sewer Systems (MS4)	84	2
Forced Drainage Pumping	2,112	1
Impacts from Hydrostructure Flow Regulation/modification	27,981	2
Industrial Point Source Discharge	2,200	2
Industrial/Commercial Site Stormwater Discharge (Permitted)	84	2
Internal Nutrient Recycling	16,314	2
Introduction of Non-native Organisms (Accidental or Intentional)	319,163	16
Irrigated Crop Production	84,048	2
Lake Fertilization	10,272	3
Managed Pasture Grazing	26,880	1
Natural Conditions - Water Quality Standards Use Attainability Analyses Needed	152,226	18
Natural Sources	76,963	9
Naturally Occurring Organic Acids	4,019	3
Non-irrigated Crop Production	134,420	6
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	9,216	2
Other Spill Related Impacts	2,598	1
Package Plant or Other Permitted Small Flows Discharges	2,112	1
Runoff from Forest/Grassland/Parkland	23,450	3
Rural (Residential Areas)	5,418	3
Sanitary Sewer Overflows (Collection System Failures)	24	1

Table 3.4.3.

Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected sources of impairment, *2008 Integrated Report*. (Reported in acres and water body count.)

Suspected Sources of Impairment	**Size**	**Count**
Sediment Resuspension (Clean Sediment)	57,530	3
Sewage Discharges in Unsewered Areas	1,747	1
Silviculture Plantation Management	1,747	1
Source Unknown	366,053	32
Unpermitted Discharge (Domestic Wastes)	9,280	1
Unspecified Land Disturbance	2,598	1
Upstream Source	24	1
Waterfowl	37,754	3
Wildlife Other than Waterfowl	9,280	1

Chapter 5: Estuary and Coastal Water Quality Assessment

Summary of Estuary and Coastal Water Quality Assessments

The figures reported in table 3.5.1 are based upon the level of use support for all applicable designated uses, as determined through monitored assessments. The square miles of impaired water bodies identified as being affected by various suspected causes of impairment are shown in table 3.5.2. The square miles affected by various suspected sources of impairment are shown in table 3.5.3. Tables 3.5.2 and 3.5.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, table 3, can be found in Appendices A, B, and C.

Table 3.5.1.

Summary of designated use support for Louisiana estuaries, *2008 Integrated Report* assessment. (Reported in square miles (water body count))

Designated Use	Size Fully Supporting	Size Not Supporting	Insufficient Data	Not Assessed	Total Size for Designated Use
Primary Contact Recreation	4,950 (50)	4 (2)	0	0	4,954 (52)
Secondary Contact Recreation	4,954 (52)	0	0	0	4,954 (52)
Fish and Wildlife Propagation	3,130 (36)	1,824 (16)	0	0	4,954 (52)
Oyster Propagation	3,422 (35)	846 (5)	0	0	4,268 (40)

<u>Suspected Causes of Non-Support of Designated Uses</u>

Table 3.5.2.

Total sizes of Louisiana estuaries not fully supporting designated uses due to various suspected causes of impairment, *2008 Integrated Report*. (Reported in square miles and water body count.)

Suspected Cause of Impairment	Size	Count
Ammonia (Total)	6	1
Carbofuran	187	1
Fecal Coliform	850	7
Mercury	1,657	9
Nitrate/Nitrite (Nitrite + Nitrate as N)	193	2
Non-Native Aquatic Plants	91	1
Oxygen, Dissolved	923	9
Phosphorus (Total)	193	2
Sedimentation/Siltation	193	2
Total Suspended Solids (TSS)	193	2
Turbidity	195	3

Suspected Sources of Non-Support of Designated Uses

Table 3.5.3.

Total sizes of Louisiana estuaries not fully supporting designated uses due to various suspected sources of impairment, *2008 Integrated Report*. (Reported in square miles and water body count.)

Suspected Sources of Impairment	Size	Count
Atmospheric Deposition - Toxics	1,657	9
Changes in Ordinary Stratification and Bottom Water Hypoxia/Anoxia	64	2
Discharges from Municipal Separate Storm Sewer Systems (MS4)	4	2
Introduction of Non-native Organisms (Accidental or Intentional)	91	1
Irrigated Crop Production	193	2
Marina/Boating Sanitary On-vessel Discharges	55	1
Natural Sources	583	4
Non-irrigated Crop Production	193	2
Package Plant or Other Permitted Small Flows Discharges	581	3
Petroleum/natural Gas Production Activities (Permitted)	581	3
Sanitary Sewer Overflows (Collection System Failures)	2	1
Sediment Resuspension (Clean Sediment)	2	1
Sewage Discharges in Unsewered Areas	4	2
Source Unknown	1,613	8
Unspecified Domestic Waste	64	2
Unspecified Urban Stormwater	64	2
Upstream Source	707	4
Urban Runoff/Storm Sewers	4	2
Wildlife Other than Waterfowl	55	1

Gulf of Mexico Hypoxic Zone Assessments

LDEQ has long acknowledged that hypoxic conditions exist during certain periods of the year in offshore waters of the Gulf of Mexico outside the State three-mile limit. LDEQ also recognizes that elevated nutrient levels associated with spring and summer runoff from the Mississippi Basin are a contributing factor in development of the hypoxic zone. In recognition of this, LDEQ has participated in the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force and development of the *Gulf Hypoxia Action Plan 2008 (GHAP)*, as well as its predecessor documents. The GHAP was also signed by the U.S. Environmental Protection Agency (USEPA) and numerous other Federal and State agencies with an interest in reducing the hypoxic zone and its effects on the gulf. LDEQ has been and remains a member agency of other national workgroups and task forces including the Gulf of Mexico Alliance charged with addressing the hypoxic zone. For more information on USEPA and State efforts to reduce hypoxia in the Gulf of Mexico and to obtain copies of the GHAP go to: http://www.epa.gov/msbasin/index.htm. The question remains, however, whether the hypoxic zone affects waters *within* the State's three-mile limit, thus representing an impairment to coastal subsegments subject to State 305(b) and 303(d) reporting requirements.

During the review period following public notice and receipt of comments LDEQ received additional data from USEPA on the Gulf of Mexico hypoxic zone. Based on these additional datasets LDEQ has determined that the coastal subsegments of: 021102 – Barataria Basin Coastal Bays and Gulf Waters to the State Three-Mile Limit; 070601 – Mississippi Basin Coastal Bays and Gulf Waters to the State Three Mile Limit; and 120806 – Terrebonne Basin Coastal Bays and Gulf Waters to the State Three-Mile Limit are suspected of impairment due to low dissolved oxygen (DO) at or near the bottom of the water column. This suspected impairment is believed to exist primarily during summer months but the temporal nature of the data precludes adequate analysis outside the summer sampling period. The suspected source of impairment has been reported as "upstream sources."

LDEQ has also determined that these suspected DO impairments will be placed in IR Category 4b. Category 4b is used for impairments caused by a pollutant that is being addressed by the State through other pollution control requirements. Other pollution control requirements were defined by USEPA guidance as including best management practices. LDEQ currently uses IR Category 4b for impairments due to noxious aquatic plants using the Louisiana Aquatic Invasive Species Council as a TMDL alternative program. In addition, LDEQ uses IR Category 4b for several legacy pollution issues being addressed by remediation activities either completed or in progress.

A more detailed explanation of this decision can be found in Appendix G: Public Comments on the 2008 Integrated Report and LDEQ's Response to Comments.

Chapter 6: Wetland Water Quality Assessment

Summary of Wetland Water Quality Assessments

The figures reported in table 3.6.1 are based upon the level of use support for all applicable designated uses, as determined through monitored assessments. The acres of impaired water bodies identified as being affected by various suspected causes of impairment are shown in table 3.6.2. The acres affected by various suspected sources of impairment are shown in table 3.6.3. Tables 3.6.2 and 3.6.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, table 3, can be found in Appendices A, B, and C.

Table 3.6.1.

Summary of designated use support for Louisiana wetlands, *2008 Integrated Report* assessment. (Reported in acres (water body count).)

Designated Use	Size Fully Supporting	Size Not Supporting	Insufficient Data	Not Assessed	Total Size for Designated Use
Primary Contact Recreation	1,017,600 (5)	7,680 (1)	0	0	1,025,280 (6)
Secondary Contact Recreation	1,029,760 (7)	0	0	47,293 (9)	1,077,053 (16)
Fish and Wildlife Propagation	622,720 (3)	402,560 (3)	0	51,773 (10)	1,077,053 (16)
Drinking Water Supply	464,000 (1)	0	0	0	464,000 (1)

<u>Suspected Causes of Non-Support of Designated Uses</u>

Table 3.6.2.

Total sizes of Louisiana wetlands not fully supporting designated uses due to various suspected causes of impairment, *2008 Integrated Report*. (Reported in acres and water body count.)

Suspected Cause of Impairment	Size	Count
Chloride	7,680	1
Mercury	199,040	1
Oxygen, Dissolved	394,880	2
Sulfates	7,680	1
Temperature, water	7,680	1
Total Dissolved Solids	7,680	1

Suspected Sources of Non-Support of Designated Uses

Table 3.6.2.

Total sizes of Louisiana wetlands not fully supporting designated uses due to various suspected sources of impairment, *2008 Integrated Report*. (Reported in acres and water body count.)

Suspected Sources of Impairment	Size	Count
Atmospheric Deposition - Toxics	199,040	1
Drainage/Filling/Loss of Wetlands	7,680	1
Habitat Modification - other than Hydromodification	7,680	1
Impacts from Hydrostructure Flow Regulation/modification	7,680	1
Littoral/shore Area Modifications (Non-riverine)	7,680	1
Non-irrigated Crop Production	195,840	1
Petroleum/natural Gas Production Activities (Permitted)	195,840	1
Source Unknown	199,040	1

Wetlands Assimilation of Wastewater

Subsidence and loss of wetlands in southern Louisiana has been caused by a combination of impoundment by artificial levees and flood control drainage. These features have essentially stopped the inflow of water and natural soil building materials into the wetlands that would normally be present during spring flooding events. Extensive scientific studies (UAAs) conducted over the past 15 years or more on wetland sites in southern Louisiana have demonstrated that controlled discharges of treated municipal wastewater to these wetlands helps to control subsidence and increases wetland productivity.

Since 1992 LDEQ has successfully implemented a program in southern/coastal Louisiana for natural wetlands to receive treated and disinfected municipal wastewater. The controlled release of low levels of nutrients from secondarily treated municipal wastewater into the wetlands benefits primarily the receiving wetlands and may also provide some economic benefit to the municipalities involved. These benefits have been documented in UAAs and in peer-reviewed, published scientific papers. The program as implemented:

- Benefits subsiding wetlands by enhanced productivity and vertical accretion and is a component of Louisiana's coastal restoration program
- Improves water quality by reducing nutrient discharges and loads
- Provides the basis for water quality standards (including nutrient criteria) to protect Louisiana's unique wetland environment, including appropriate vegetative criteria and nutrient loading rate guidance

The wetlands assimilation process is documented in part by amending the water quality standards in LAC 33:IX-Chapter 11 to protect wetland areas that may receive treated wastewater effluent. A wetlands category is being proposed as well as definitions, which include classifications of wetlands types, and biological assessment criteria for wetlands to receive treated and disinfected sanitary effluent. Water quality standards revisions for wetland assimilation are supported by implementation procedures outlined in the department's current Water Quality Management Plan. These procedures, though not part of the regulations, will be cited in the water quality standards.

Discharges to wetlands are evaluated by LDEQ on a site-specific basis. Past projects are outlined in the 1996 and 2000 §305(b) reports (available at: http://www.deq.louisiana.gov/portal/tabid/98/ Default.aspx.). To date, wetland wastewater assimilation projects have been completed and wetland discharge permits have been issued for the cities of Thibodaux, Breaux Bridge, Amelia, St. Martinville, Mandeville, Luling, and Hammond. Several other cities are in the process of completing the assimilation application requirements for a permit to discharge to wetlands. These include facilities on the north shore of Lake Pontchartrain, west bank of Jefferson Parish, and Orleans Parish in eastern Louisiana and facilities in the Vermilion-Teche and Mermentau Basins in western Louisiana. Several facilities in coastal cities impacted by Hurricanes Katrina and Rita in 2005 are being considered for wetland assimilation. By improving the health of subsiding wetlands through the controlled application of treated effluent, wetlands may suffer less extensive damage from future hurricanes and storms.

Chapter 7: Public Health/Aquatic Life Concerns

Fishing and Swimming Advisories Currently in Effect

The LDEQ currently issues fish consumption and swimming advisories in conjunction with the Louisiana Department of Health and Hospitals (LDHH). Fish consumption advisories are set using a risk assessment-based method that establishes consumption levels designed to prevent adverse effects on public health. Risk assessments are used to determine safe consumption levels for different segments of the population. For example, children and pregnant or breastfeeding women are often considered separately in developing risk assessments because this population is generally considered to be at greater risk from consumption of contaminated seafood. Therefore, limited consumption advisories will often be stricter for this population.

Swimming advisories are generally established due to fecal coliform contamination of a water body. However, a limited number of swimming advisories have been based on chemical contamination of water or sediments. Fecal coliform contamination of a water body can be caused by a number of possible sources including absent or inadequate sewage treatment systems, poorly maintained septic tanks, direct sewage discharges from camps, pasture and animal holding area runoff, and wildlife. Efforts are being made to correct these problems statewide. For the latest information on advisories please refer to LDEQ's web site at: http://www.deq.louisiana.gov/portal/Default.aspx?tabid=1631.

PART IV. GROUND WATER ASSESSMENT

For this report, USEPA has encouraged states to select an aquifer or hydrogeologic setting and discuss available data that best reflects the quality of the resource. For 2008, aquifer summary data from the **BASELINE MONITORING PROGRAM** for the Eocene/Paleocene age aquifers, which include the Carrizo-Wilcox, Sparta and Cockfield aquifers, is presented. While these aquifers represent geologically, the oldest freshwater aquifers in Louisiana, they include some of the shallowest wells and groundwater in the state. Table 4.1.1 shows the hydrogeologic column of aquifers in Louisiana and the occurrence of these three Eocene/Paleocene aquifers in regard to other younger aquifers in the state.

Table 4.1.2 is designed to provide an indication of the most critical contaminant sources and contaminants impacting ground water resources in Louisiana. Table 4.1.3 provides a summary of Louisiana ground water protection programs. It provides an overview of legislation, statutes, rules, and/or regulations that are in place. It also provides an indication of how comprehensive ground water protection activities are in Louisiana. Table 4.1.4 provides a quick look at the number of wells used for this report, the number of wells reporting non-detects for parameter groups of interest, and a more detailed look at the occurrence of nitrite-nitrate.

Table 4.1.6 and table 4.1.7 list the field and conventional parameters, and the inorganic (total metals) parameters respectively, for which samples are collected. They also detail the analytical results for those parameters for each well for each respective aquifer. Table 4.1.8 lists the field and conventional parameters' statistical values for minimum, maximum and average concentrations. It should be noted that, per Department standard procedure, one-half the detection limit is used when determining averages when a non-detect is reported. Table 4.1.9 shows a listing of inorganic statistics of minimum, maximum and average values, also utilizing the half detection limit value for non-detects.

The Water Quality Assessment Division's Baseline Monitoring Program provides water quality data from fresh water aquifers around the State. Wells producing from a common aquifer are sampled in a narrow time frame. The smaller aquifers can be sampled in one or two days, whereas the larger aquifers may take several months to complete. At such time when all assigned wells of a particular aquifer have been sampled, a summary report is written. Data from the summary reports for the Carrizo-Wilcox, Sparta and Cockfield aquifers are used in this report.

Table 4.1.1.
Hydrogeologic column of aquifers in Louisiana.

SYSTEM	SERIES	Stratigraphic Unit		Hydrogeologic Unit: Northern Louisiana — Aquifer or confining unit	Central and southwestern Louisiana — Aquifer system or confining unit	Central and southwestern Louisiana — Aquifer or confining unit: Lake Charles area	Central and southwestern Louisiana — Aquifer or confining unit: Rice growing area	Southeastern Louisiana — Aquifer system or confining unit	Southeastern Louisiana — Aquifer[1] or confining unit: Baton Rouge area	Southeastern Louisiana — Aquifer[1] or confining unit: St. Tammany, Tangipahoa, and Washington Parishes	Southeastern Louisiana — Aquifer[1] or confining unit: New Orleans area and lower Mississippi River parishes
Quaternary	Pleistocene	Red River alluvial deposits Miss. River alluvial deposits Northern La. Terrace deposits Unnamed Pleistocene deposits		Red River alluvial aquifer or surficial confining unit Mississippi River alluvial aquifer or surficial confining unit Upland terrace aquifer or surficial confining unit	Chicot aquifer system or surficial confining unit	"200-foot" sand	Upper sand unit	Chicot Equivalent aquifer system[2] or surficial confining unit	Mississippi River alluvial aquifer or surficial confining unit Shallow sand "400-foot" sand "600-foot" sand	Upland terrace aquifer Upper Ponchatoula aquifer	Gramercy aquifer[3] Norco aquifer[3] Gonzales-New Orleans Aquifer[3] "1,200-foot" sand[3]
						"500-foot" sand "700-foot" sand	Lower sand unit				
Tertiary	Pliocene -----?----- Miocene	Fleming Formation	Blounts Creek Member	Pliocene-Miocene aquifers are absent in this area	Evangeline aquifer or surficial confining unit			Evangeline equivalent aquifer system[2] or surficial confining unit	"800-foot" sand "1,000-foot" sand "1,200-foot" sand "1,500-foot" sand "1,700-foot" sand	Lower Ponchatoula aquifer Big Branch aquifer Kentwood aquifer Abita aquifer Covington aquifer Slidell aquifer	
			Castor Creek Member		Castor Creek confining unit			Unnamed confining unit	"2,000-foot" sand "2,400-foot" sand "2,800-foot" sand	Tchefuncte aquifer Hammond aquifer Amite aquifer Ramsay aquifer Franklinton aquifer	
			Williamson Creek Member Dough Hills Member Carnahan Bayou Member		Jasper aquifer system or surficial confining unit	Williamson Creek aquifer Dough Hills confining unit Carnahan Bayou aquifer		Jasper equivalent aquifer system[2] or surficial confining unit			
			Lena Member		Lena confining unit			Unnamed confining unit			
	-----?----- Oligocene	Catahoula Formation			Catahoula aquifer			Catahoula equivalent aquifer system[2] or surficial confining unit			
		Vicksburg Group, undifferentiated		Vicksburg-Jackson confining unit	No fresh water occurs in older aquifers						
	Eocene	Jackson Group, undifferentiated									
		Claiborne Group	Cockfield Formation	**Cockfield aquifer or surficial confining unit**							
			Cook Mountain Formation	Cook Mountain aquifer or confining unit							
			Sparta Sand ? Cane River Formation	**Sparta aquifer or surficial confining unit**							
				Cane River aquifer or confining unit							
			Carrizo Sand	**Carrizo-Wilcox aquifer or surficial confining unit**							
	Paleocene	Wilcox Group, undifferentiated									
		Midway Group, undifferentiated		Midway confining unit							

Source: DOTD/USGS Water Resources Special Report No. 9, 1995

[1]Clay units separating aquifers in southeastern Louisiana are discontinuous and unnamed.

[2]Four aquifer systems as a group are called the Southern Hills aquifer system.

[3]Four aquifers as a group are called the New Orleans aquifer system.

Index to Table 4.1.2

<u>Factors in selecting a contaminant source</u>

A. Human health and/or environmental risk (toxicity)
B. Size of the population at risk
C. Location of the sources relative to drinking water sources
D. Number and/or size of contaminant sources
E. Hydrogeologic sensitivity
F. State findings, other findings
G. Documented from mandatory reporting
H. Geographic distribution/occurrence
I. Other criteria - high to very high priority in localized areas of the state

<u>Contaminants</u>

A. Inorganic pesticides
B. Organic pesticides
C. Halogenated solvents
D. Petroleum compounds
E. Nitrate
F. Fluoride
G. Salinity/brine
H. Metals
I. Radionuclides
J. Bacteria
K. Protozoa
L. Viruses
M. Other - sulfates from gypsum stacks

Table 4.1.2.
Major sources of ground water contamination in the Eocene/Paleocene aquifers of Louisiana.

Contaminant Source	Ten Highest-Priority Sources(√)	Factors in Selecting a Contaminant Source	Contaminants
Agricultural Activities			
Agricultural chemical facilities			
Animal feedlots			
Drainage wells			
Fertilizer applications			
Irrigation practices			
Pesticide applications			
On-farm agricultural mixing and loading procedures			
Land application of manure (unregulated)			
Storage and Treatment			
Land Application			
Material stockpiles			
Storage tanks (above ground)	√	A,B,C,D,E,F,G	B,C,D
Storage tanks (underground)	√	A,B,C,D,E,F,	B,C,D
Surface impoundments	√	A,B,C,D,E,F,G	C,D,G,H,J,L
Waste piles	√	D,G	I,M
Waste tailings			
Disposal Activities			
Deep injection wells			
Landfills	√	A,B,C,D,E,F,G	A,B,C,D,E,H
Septic systems	√	C,D,G	A,B,C,D,E,H,J,L
Shallow injection wells			
Other			
Hazardous waste generators*			
Hazardous waste sites*			
Industrial facilities*			
Material transfer operations*			
Mining and mine drainage			
Pipelines and sewer lines	√	A,B,C,D,E,F,G	C,D,G
Salt storage and road salting			
Salt water intrusion	√	B,C,E,G	G
Spills	√	B,D,G	C,D
Transportation of materials			
Urban runoff	√	A,B,D,G	A,B,C,D,E,H,J,L
Small-scale manufacturing and repair shops			
Other sources (please specify)			

* Represents facilities with multiple sources of ground water contamination rather than unit sources.

Table 4.1.3.
Summary of state ground water protection programs for Louisiana.

Programs or Activities	Check	Implementation Status	Responsible State Agency
Active SARA Title III Program	√	Fully established	LDEQ
Ambient ground water monitoring system	√	Fully established	LDEQ
Aquifer vulnerability assessment	√	Fully established	LDEQ
Aquifer mapping	√	Fully established	LDEQ
Aquifer characterization	√	Continuing efforts	LDOTD
Comprehensive data management system	√	Continuing efforts	LDEQ
EPA-endorsed Core Comprehensive State Ground Water Protection Program (CSGWPP)	√	Pending	LDEQ
Ground water discharge permits	√	Fully established	LDNR(UIC)
Ground water Best Management Practices	√	Continuing efforts	LDEQ
Ground water legislation	√	Fully Established	LDNR
Ground water classification	√	Fully established	LDEQ
Ground water quality standards	√	Continuing efforts	LDEQ
Interagency coordination for ground water protection initiatives	√	Fully established	LDEQ
Nonpoint source controls	√	Continuing efforts	LDEQ
Pesticide State Management Plan	√	Fully Established	LDAF
Pollution Prevention Program	√	Continuing efforts	LDEQ
Resource Conservation and Recovery Act (RCRA) Primacy	√	Fully established	LDEQ
Source Water Assessment Program	√	Fully established	LDEQ
State Superfund	√	Fully established	LDEQ
State RCRA Program incorporating more stringent requirements than RCRA Primacy	√	Continuing efforts	LDEQ
State septic system regulations	√	Fully established	LDHH
Underground storage tank installation requirements	√	Fully established	LDEQ
Underground Storage Tank Remediation Fund	√	Fully established	LDEQ
Underground Storage Tank Permit Program	√	Fully established	LDEQ
Underground Injection Control Program	√	Fully established	LDNR
Vulnerability assessment for drinking water/wellhead protection	√	Fully established	LDEQ
Well abandonment regulations	√	Fully established	LDOTD
Wellhead Protection Program (EPA-approved)	√	Fully established	LDEQ
Well installation regulations	√	Fully established	LDOTD

Ambient Monitoring Network for Eocene/Paleocene Age Aquifers

The data that follows were derived from the Baseline Monitoring Program of the Water Quality Assessment Division of LDEQ. The program is conducted as a Clean Water Act activity, with the objectives of determining and monitoring the quality of ground water produced from the freshwater aquifers across Louisiana, and providing water quality data to the Department, other state and federal agencies, and corporate and private citizens of Louisiana.

Figures 4.1.1, 4.1.2 and 4.1.3 show the geographic locations of the Carrizo-Wilcox, Sparta and Cockfield aquifers, respectively, and the associated wells. Table 4.1.5 lists all the wells sampled, the aquifer in which they are completed, their total depths, and the use made of produced waters.

In March of 2005, and then from July through September of 2006, thirty-eight wells were sampled which produce from Carrizo-Wilcox, Sparta, and Cockfield aquifers. Eleven of the wells are completed in the Carrizo-Wilcox aquifer, fourteen are completed in the Sparta aquifer, and thirteen are completed in the Cockfield aquifer. Of these 38 wells, 25 are classified as public supply, five are classified as industrial use, five are classified as domestic with the remaining three wells classified as irrigation wells by the Louisiana Department of Transportation and Development. The wells are located in seventeen parishes in approximately the northern half of the state.

Physical well data for registered water wells was obtained from the Louisiana Department of Transportation and Development's Water Well Registration Data file

Hydrogeologic Setting

<u>Carrizo-Wilcox Aquifer</u>

Geology

The Carrizo-Wilcox aquifer system consists of the Carrizo Sand of the Eocene Claiborne group and the undifferentiated Wilcox group of Eocene and Paleocene age. The Wilcox deposits, outcropping in northwestern Louisiana, are the oldest deposits in the state containing fresh water. The Carrizo is discontinuous and consists of well-sorted, fine to medium grained, cross-bedded sands, with some silt and lignite. Well yields are restricted because the sand beds are typically thin, lenticular and fine textured. The system is confined downdip by the clays and silty clays of the overlying Cane River formation and the regionally confining clays of the underlying Midway group.

Hydrogeology

Primary recharge of the Carrizo-Wilcox aquifer occurs from direct infiltration of rainfall in interstream, upland outcrop-subcrop areas. Water also moves between overlying alluvial and terrace aquifers, the Sparta aquifer, and the Carrizo-Wilcox aquifer, according to hydraulic head differences. Water level fluctuations are mostly seasonal, and the hydraulic conductivity varies between 2-40 feet/day.

The maximum depths of occurrence of freshwater in the Carrizo-Wilcox range from 200 feet above sea level, to 1,100 feet below sea level. The range of thickness of the fresh water interval in the Carrizo-Wilcox is 50 to 850 feet. The depths of the Carrizo-Wilcox wells that were monitored range from 105 to 410 feet below ground level.

<u>Sparta Aquifer</u>

Geology

The Sparta aquifer system is within the Eocene Sparta formation of the Claiborne group. The aquifer units consist of fine to medium sand with interbedded coarse sand, silty clay and lignite. Interconnected sands become more massive and coarsen slightly with depth and are laterally discontinuous. The Sparta aquifer is confined downdip by the clays of the overlying Cook Mountain formation and the clays and silty clays of the Cane river formation.

Hydrogeology

The Sparta aquifer is recharged through direct infiltration of rainfall, the movement of water through overlying terrace and alluvial deposits, and leakage from the Cockfield and Carrizo-Wilcox aquifers. The Sparta is pumped in a large area of north central Louisiana and in a narrow band through Natchitoches and Sabine parishes. The two areas are separated by a saltwater ridge below the Red River valley. Ground water movement is eastward toward the Mississippi River Valley and southward toward the Gulf of Mexico, except when altered by heavy pumping. Hydraulic conductivity of the Sparta aquifer varies between 25 to 100 feet/day.

The maximum depths of occurrence of freshwater in the Sparta range from 200 feet above sea level, to 1,700 feet below sea level. The range of thickness of the fresh water interval in the Sparta is 50 to 700 feet. The depths of the Sparta wells that were monitored range from 153 to 773 feet below ground level.

Cockfield Aquifer

Geology

The Cockfield aquifer is within the Eocene Cockfield formation of the Claiborne Group, which consists of sands, silts, clays, and some lignite. The aquifer units consist of fine sand with interbedded silt, clay, and lignite, becoming more massive and containing less silt and clay with depth. Beneath the Ouachita River, the Cockfield aquifer has been eroded by the ancestral Ouachita River and replaced by alluvial sands and gravels. The regional confining clays of the overlying Vicksburg and Jackson Groups confine the Cockfield.

Hydrogeology

In the Mississippi River valley, the Cockfield is overlain by and hydraulically connected to the alluvial aquifers. Recharge to the Cockfield aquifer occurs primarily by the direct infiltration of rainfall in interstream, upland outcrop-subcrop areas, the movement of water through the alluvial and terrace deposits, and vertical leakage from the underlying Sparta aquifer. The Cockfield contains fresh water in north-central and northeast Louisiana in a narrowing diagonal band extending toward Sabine Parish. Saltwater ridges under the Red River valley and the eastern Ouachita River valley divide areas containing fresh water in the Cockfield aquifer. The hydraulic conductivity varies between 25-100 feet/day.

The maximum depths of occurrence of freshwater in the Cockfield range from 200 feet above sea level, to 2,150 feet below sea level. The range of thickness of the fresh water interval in the Cockfield is 50 to 600 feet. The depths of the Cockfield wells that were monitored range from 80 to 445 feet below ground level.

Table 4.1.4. Monitoring data.

Hydrogeologic Setting: **Eocene/Paleocene Age Aquifers**
Spatial Description: **Northern Louisiana**
Map Available: **See Figures 4.1.1, 4.1.2 and 4.1.3**
Data Reporting Period: **March 2005 – September 2006**

Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells									
			No detections of parameters above MDLs or background levels		Nitrite/nitrate concentrations range from background levels to less than or equal to 5 mg/l. No detections of parameters other than nitrite/nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable.			Nitrite/nitrate ranges from greater than 5 to less than or equal to 10 mg/l. Other parameters are detected at concentrations exceeding the MDL but are less than or equal to the MCLs.	Parameters are detected at concentrations exceeding the MCLs	Number of wells removed from service	Number of wells requiring special treatment	Back-ground para-meters exceed MCLs
			ND	Number of wells in sensitive or vulnerable areas	Nitrite/ nitrate < 1 mg/l	Nitrite/ nitrate $\geq$ 1 to $\leq$ 5 mg/l	Number of wells in sensitive or vulnerable areas					
Ambient Monitoring Network	38	VOC	36									
		SOC	38									
		NO2NO3	29		6	2		1				
		*Other	37					1				

***For Other category, the following metals were considered: Antimony, Arsenic, Beryllium, Cadmium, Chromium, Lead, Mercury, Selenium, and Thallium.**

USEPA Drinking Water Standards

Primary Drinking Water Standards

Table 4.1.6 shows the field and conventional parameters, and table 4.1.7 shows the inorganic (total metals) parameters, for which samples are collected along with the analytical results for those parameters for each well for each respective aquifer. Due to the large number of analytes for volatile and semi-volatile organic compounds and pesticides/PCBs, tables were not constructed for these parameter groups. Any detection of these analytes will be discussed later in each respective analyte group section. For a listing of analytes for these parameter groups, see tables 4.1.10, 4.1.11 and 4.1.12 later in this document.

Federal Primary Drinking Water Standards: Under the Federal Safe Drinking Water Act, the USEPA has established maximum contaminant levels (MCLs) for pollutants that may pose a health risk in public drinking water. An MCL is the highest level of a contaminant that the USEPA allows in public drinking water. MCLs ensure that drinking water does not pose either a short-term or long-term health risk. While not all wells sampled were public supply wells, MCLs are used as a benchmark for evaluation. Laboratory data show that no Primary MCL was exceeded in any of the BMP wells that were sampled for the monitoring of the Carrizo-Wilcox, Sparta or Cockfield aquifers from March 2005 to August 2006.

Secondary Drinking Water Standards

The USEPA has set secondary standards, which are defined as non-enforceable taste, odor or appearance guidelines. Field and laboratory data contained in table 4.1.6 and inorganic data contained in table 4.1.7, show that twenty-eight wells exceeded at least one secondary standard (SMCL), with a total of six SMCLs being exceeded. Listed below are those wells and SMCLs that were exceeded. The most common secondary standards exceeded in the Eocene/Paleocene age aquifers were pH, color, total dissolved solids and iron.

Carrizo-Wilcox aquifer

pH – SMCL greater than 8.5 or less than 6.5 Standard Units

BI-236 – 8.90 SU
BO-274 – 8.71 SU
CD-453 – 8.75 SU
DS-363 – 8.82 SU
DS-5996Z – 8.66 SU
SA-502 – 6.44 SU

Color – SMCL = 15 PCU

CD-453 – 24 PCU

Total Dissolved Solids – SMCL = 500 ppm

BI-236 – 702 ppm
CD-453 – 684 ppm
CD-639 – 680 ppm
DS-363 – 536 ppm

Iron – SMCL = 300 ppb

BO-275 – 355 ppb
CD-630 – 551 ppb

Sparta aquifer

pH – SMCL greater than 8.5 or less than 6.5 Standard Units

CA-105 – 8.92 SU
CL-203 – 6.48 SU (Original and Duplicate)
L-32 – 8.70 SU
MO-253 –8.81 SU (Original and Duplicate)
OU-506 – 9.03 SU
OU-597 – 8.77 SU
UN-205 – 8.81 SU (Original and Duplicate)
W-165 – 8.68 SU

Color – SMCL = 15 PCU

W-165 – 60 PCU

Total Dissolved Solids – SMCL = 500 ppm

CA-105 – 662 ppm
MO-253 – 1,090 ppm, Duplicate – 1,052 ppm
OU-506 – 538 ppm
OU-597 – 1,112 ppm

UN-205 – 740 ppm, Duplicate – 772 ppm

Chloride – SMCL = 250 ppm
MO-253 – 373 ppm, Duplicate – 375 ppm
OU-597 – 419 ppm
UN-205 – 315 ppm, Duplicate – 354 ppm

Iron – SMCL = 300 ppb
BI-212 – 2,170 ppb
CL-203 – 1,380 ppb (Original and Duplicate)
SA-534 – 1,490 ppb

Cockfield aquifer

pH – SMCL greater than 8.5 or less than 6.5 Standard Units
UN-167 – 6.47 SU

Color – SMCL = 15 PCU
CA-35 – 22 PCU SA-BYRD – 50 PCU
W-192 – 21 PCU W-198 – 50 PCU

Total Dissolved Solids – SMCL = 500 ppm
NA-5614Z – 608 ppm SA-BYRD – 794 ppm
W-192 – 551 ppm WC-187 – 598 ppm
WC-487 – 558 ppm

Iron – SMCL = 300 ppb
CA-35 – 6,600 ppb EC-233 – 635 ppb
MO-479 – 2,150 ppb, duplicate – 2,200 ppb NA-5614Z – 395 ppb
UN-167 – 2,830 ppb

Volatile Organic Compounds

There were no Drinking Water Standards exceeded for this group of compounds in any of the three aquifers sampled. However, two wells did report very low levels (most < 10 ppb) of what are considered to be chlorination by-products. East Carroll Parish well EC-233, a public supply well completed in the Cockfield aquifer, reported low levels of chloroform, bromodichloromethane and dibromochloromethane. Caddo Parish well CD-642, an industrial well completed in the Carrizo-Wilcox aquifer, reported chloroform at 3.43 ppb. None of these compounds have drinking water standards established for them, either primary or secondary. No other volatile organic compounds were detected at or above their detection limits from any of the wells sampled from the Eocene/Paleocene age aquifers of Louisiana.

Semi-volatile Organic Compounds

There were no semi-volatile organic compounds detected at or above their detection limits from any of the wells sampled from the Eocene/Paleocene age aquifers of Louisiana.

Pesticides and PCBs

There were no pesticides or PCBs detected at or above their detection limits from any of the wells sampled from the Eocene/Paleocene age aquifers of Louisiana.

Summary

The data show that the ground water produced from the Eocene/Paleocene aquifers of Louisiana, namely the Carrizo-Wilcox, Sparta and Cockfield aquifers, is of good quality when considering short-term or long-term health risk guidelines. Laboratory data from the analysis of the samples collected from the wells completed in these three aquifers show that no primary drinking water standard was exceeded in any of the wells.

For the Carrizo-Wilcox aquifer, the data show that the water is generally soft with an average hardness of 37.9 ppm.[1] The ground water produced from this aquifer is of fair to good quality when considering taste, odor or appearance guidelines (non-enforceable secondary standard or SMCL), with only thirteen SMCLs exceeded overall.

Ground water produced from the Sparta aquifer is also soft with a hardness average of 13.7 ppm. However, when considering secondary standards for drinking water, the Sparta produces water that is of fair quality, in that twenty individual secondary standards were exceeded, the most of the three aquifers sampled.

Analytical data derived from the Cockfield aquifer show that the ground water is moderately hard, with an average hardness of 140 ppm. When considering the secondary taste, odor or appearance guidelines, the quality of ground water produced from this aquifer is between that of the Sparta and Carrizo-Wilcox. This is based on fewer individual SMCLs being exceeded (fifteen) than the Sparta, and considering the moderately hard classification.

In conclusion, the data derived from the sampling of the Eocene/Paleocene age aquifers of Louisiana show that the ground water produced from them meet all USEPA Primary Drinking Water Standards, that the ground water ranges from soft to moderately hard and that the ground water is of fair quality when considering non-enforceable taste, odor, or appearance guidelines.

[1] Classification based on hardness scale from: Peavey, H. S. et al., *Environmental Engineering*, 1985.

Table 4.1.5.
BMP wells sampled completed in Eocene/Paleocene aquifers.

Aquifer	DOTD Well Name	Parish	Date Sampled	Well Owner	Depth (in feet)	Well Use
Carrizo-Wilcox	BI-236	Bienville	11/14/2006	Alberta Water System	410	Public Supply
Carrizo-Wilcox	BO-274	Bossier	9/18/2006	Village Water System	395	Public Supply
Carrizo-Wilcox	BO-275	Bossier	9/19/2006	Village Water System	308	Public Supply
Carrizo-Wilcox	CD-453	Caddo	9/18/2006	City of Vivian	228	Public Supply
Carrizo-Wilcox	CD-630	Caddo	9/19/2006	Private Owner	240	Irrigation
Carrizo-Wilcox	CD-639	Caddo	9/19/2006	SI Precast	200	Industrial
Carrizo-Wilcox	CD-642	Caddo	9/19/2006	Louisiana Lift	210	Industrial
Carrizo-Wilcox	DS-363	De Soto	11/13/2006	City of Mansfield	280	Public Supply
Carrizo-Wilcox	DS-5996Z	De Soto	11/13/2006	Private Owner	360	Domestic
Carrizo-Wilcox	RR-5070Z	Red River	11/14/2006	Private Owner	105	Domestic
Carrizo-Wilcox	SA-502	Sabine	11/13/2006	Private Owner	213	Irrigation
Sparta	BI-192	Bienville	8/22/2006	Lucky Water System	153	Public Supply
Sparta	BI-212	Bienville	8/22/2006	Stone Container, Corp.	490	Industrial
Sparta	CA-105	Caldwell	7/11/2006	Vixen Water System	525	Public Supply
Sparta	CL-203	Claiborne	7/18/2006	Town of Homer	460	Public Supply
Sparta	L-31	Lincoln	7/10/2006	City of Ruston	636	Public Supply
Sparta	L-32	Lincoln	7/10/2006	City of Ruston	652	Public Supply
Sparta	MO-253	Morehouse	7/11/2006	Village of Collinston	773	Public Supply
Sparta	OU-506	Ouachita	7/11/2006	Angus Chemical	506	Industrial
Sparta	OU-597	Ouachita	7/11/2006	Graphic Packaging International	710	Industrial
Sparta	SA-534	Sabine	7/10/2006	Boise Cascade	543	Public Supply
Sparta	UN-205	Union	8/21/2006	D'Arbonne Water System	725	Public Supply
Sparta	W-165	Winn	8/22/2006	Town of Winnfield	456	Public Supply
Sparta	WB-241	Webster	8/21/2006	Town of Springhill	408	Public Supply
Sparta	WB-269	Webster	8/22/2006	City of Minden	280	Public Supply
Cockfield	CA-35	Caldwell	3/14/2005	City of Columbia	298	Public Supply

Aquifer	DOTD Well Name	Parish	Date Sampled	Well Owner	Depth (in feet)	Well Use
Cockfield	EC-233	East Carroll	2/22/2005	Town of Lake Providence	371	Public Supply
Cockfield	MO-479	Morehouse	2/21/2005	Bayou Bonne Idee Water System	258	Public Supply
Cockfield	NA-5614Z	Natchitoches	3/15/2005	Private Owner	176	Domestic
Cockfield	OU-FRITH	Ouachita	3/14/2005	Private Owner	80	Domestic
Cockfield	RI-127	Richland	2/21/2005	Delhi Waterworks	416	Public Supply
Cockfield	RI-450	Richland	2/21/2005	River Road Waterworks	283	Public Supply
Cockfield	SA-BYRD	Sabine	3/15/2005	Private Owner	150	Domestic
Cockfield	UN-167	Union	3/14/2005	Private Owner	110	Irrigation
Cockfield	W-192	Winn	3/15/2005	Red Hill Water System	210	Public Supply
Cockfield	W-198	Winn	3/15/2005	Atlanta Water System	445	Public Supply
Cockfield	WC-187	West Carroll	2/22/2005	New Carroll Water Assn.	110	Public Supply
Cockfield	WC-487	West Carroll	2/22/2005	Town of Oak Grove	396	Public Supply

Table 4.1.6.
Summary of field and conventional parameters data.

WELL NAME	PH SU	SAL. PPT	SP. COND. MMHOS/CM	TDS G/L	TEMP DEG. C	ALK. PPM	NH3 PPM	CL PPM	COLOR PCU	HARD PPM	NITRITE-NITRATE (AS N) PPM	TKN PPM	TOT. P PPM	SP. COND. UMHOS/CM	SO4 PPM	TDS PPM	TSS PPM	TURB NTU
	LABORATORY DETECTION LIMITS →					2.0	0.1/ 0.2	1.3	5.0	5.0	0.05	0.1	0.05	10	1.25/ 1.3	4.0	4.0	1.0
	FIELD PARAMETERS					LABORATORY PARAMETERS												
Carrizo-Wilcox Aquifer																		
BI-236	8.90	0.45	0.909	0.59	23.93	626	0.72	24.3	Not reported from Lab	<5	<0.05	‡1.25	0.96	1167	<1.25	702	<4	1.5
BO-274	8.71	0.14	0.296	0.19	20.87	70.8	0.27	22.5	9	9.1	<0.05	0.3	0.45	199	<1.25	112	<4	2.3
BO-275	7.77	0.29	0.595	0.39	21.11	211	1.3	51.5	<5	107	<0.05	1.33	<0.05	566	12.6	336	<4	3.3
CD-453	8.75	0.62	1.233	0.80	20.64	324	1.02	176	24	19.7	<0.05	1.13	0.37	1181	25.3	684	<4	<1
CD-630	7.65	0.22	0.463	0.30	21.23	216	0.24	17.7	6	118	<0.05	0.33	0.21	439	6.4	276	<4	6
CD-639	8.34	0.61	1.225	0.80	22.68	372	0.47	181	11	12.3	0.39	0.64	0.21	1212	<1.3	680	5	2
CD-642	8.44	0.28	0.567	0.37	20.74	260	0.71	29.8	<5	12.8	<0.05	0.77	0.08	547	4	324	<4	<1
CD-642*	8.44	0.28	0.567	0.37	20.74	261	0.69	31.8	<5	12.2	<0.05	0.71	0.08	561	4.1	338	<4	<1
DS-363	8.82	0.47	0.946	0.62	20.69	391	†0.48	79	Not reported from Lab	<5	<0.05	‡0.59	0.24	951	<1.25	536	<4	1.3
DS-5996Z	8.66	0.37	0.748	0.49	20.67	348	0.91	23.3		10	0.07	‡1.02	0.21	749	26.7	432	<4	2.2
RR-5070Z	6.61	0.25	0.52	0.34	26.94	26.8	<0.1	138		93	0.51	‡0.38	†0.07	527	3.9	292	<4	1.9
SA-502	8.62	0.37	0.751	0.49	21.70	294	0.71	21.9		<5	<0.05	0.75	0.2	769	71.7	444	<4	1.3
Sparta Aquifer																		
BI-192	6.97	0.10	0.204	0.13	20.20	3.2	<0.2	1.8	<5	6.6	1.21	<0.1	<0.05	26.1	<1.3	29	<4	<1
BI-212	6.69	0.17	0.363	0.24	21.32	87.7	0.26	6.7	15	27.9	<0.05	0.3	0.15	199	9	181	<4	1.1
CA-105	8.92	0.54	1.102	0.72	25.60	582	0.67	17.7	Not reported from Lab	<5	<0.05	0.9	0.78	1048	<1.3	662	<4	1.3
CL-203	6.48	0.07	0.145	0.09	22.05	51.7	<0.1	‡5.8		20	<0.05	0.18	0.08	130	‡7.8	114	<4	<1
CL-203*	6.48	0.07	0.145	0.09	22.05	51.6	<0.1	4.9		20.1	<0.05	0.14	0.08	129	7.4	117	<4	<1
L-31	7.90	0.19	0.398	0.26	24.40	147	<0.1	21		6.8	<0.05	<0.1	0.29	356	11.2	232	<4	<1
L-32	8.70	0.17	0.366	0.24	24.90	150	†0.16	8.3		<5	<0.05	‡0.2	0.3	329	13.5	215	<4	1.5
MO-253	8.81	1.00	1.978	1.29	25.69	418	0.86	‡373		6.2	<0.05	0.95	0.48	2000	<1.3	1090	<4	<1
MO-253*	8.81	1.00	1.978	1.29	25.69	420	0.86	‡375		6.1	<0.05	0.87	0.47	2000	<1.25	1052	<4	<1
OU-506	9.03	0.45	0.906	0.59	23.07	299	0.57	108		<5	<0.05	0.64	0.48	895	<1.3	538	<4	<1
OU-597	8.77	1.04	2.034	1.32	25.48	348	0.84	‡419		9.6	<0.05	0.92	0.52	2040	<1.25	1112	<4	<1

WELL NAME	PH SU	SAL. PPT	SP. COND. MMHOS/CM	TDS G/L	TEMP DEG. C	ALK. PPM	NH3 PPM	CL PPM	COLOR PCU	HARD PPM	NITRITE-NITRATE (AS N) PPM	TKN PPM	TOT. P PPM	SP. COND. UMHOS/CM	SO4 PPM	TDS PPM	TSS PPM	TURB NTU
	LABORATORY DETECTION LIMITS →					2.0	0.1/ 0.2	1.3	5.0	5.0	0.05	0.1	0.05	10	1.25/ 1.3	4.0	4.0	1.0
	FIELD PARAMETERS					LABORATORY PARAMETERS												
SA-534	7.12	0.10	0.205	0.13	24.46	53.9	†0.16	11.7		21	<0.05	‡0.2	0.07	184	19.9	188	<4	<1
UN-205	8.81	0.82	1.64	1.07	25.75	168	0.93	‡351	10	16.1	<0.05	1	0.18	1467	<1.25	740	<4	<1
UN-205*	8.81	0.82	1.64	1.07	25.75	167	0.95	‡354	10	15.6	<0.05	1.16	0.18	1448	<1.25	772	<4	<1
W-165	8.68	0.40	0.825	0.54	23.24	293	0.36	44.4	60	<5	<0.05	0.39	0.61	665	4.6	418	<4	<1
WB-241	7.89	0.35	0.725	0.47	24.08	157	0.43	20.5	<5	32.4	0.07	0.5	0.1	363	10.4	238	<4	<1
WB-269	7.53	0.19	0.401	0.26	20.47	46.4	0.15	28	<5	26.4	1.2	<0.1	0.06	227	16.8	146	<4	<1
Cockfield Aquifer																		
CA-35	6.54	0.15	0.31	0.20	19.97	88.2	0.14	18.5	22	104	<0.05	0.3	0.49	319	40.8	241	<4	1.4
EC-233	7.24	0.36	0.73	0.47	19.28	375	<0.1	33	<5	188	<0.05	<0.1	0.21	769	5.7	450	<4	4.5
MO-479	7.09	0.28	0.58	0.37	20.38	322	0.28	35.7	<5	323	<0.05	0.29	0.14	690	9.8	390	4.7	25
MO-479*	7.09	0.28	0.58	0.37	20.38	321	0.27	35.8	<5	324	<0.05	0.35	0.14	692	9.8	386	4	25
NA-5614Z	7.45	0.47	0.94	0.61	17.09	185	0.84	79.9	<5	8.5	<0.05	0.99	0.55	961	149	608	<4	2.1
OU-FRITH	8.12	0.28	0.57	0.37	18.48	319	0.49	2.7	<5	39.5	<0.05	0.55	0.07	561	<1.25	340	<4	<1
OU-FRITH*	8.12	0.28	0.57	0.37	18.48	321	0.5	2.8	<5	37.4	<0.05	0.5	0.07	559	<1.25	342	<4	<1
RI-127	7.86	0.41	0.84	0.54	22.00	377	0.83	64.8	5	7.8	<0.05	1.01	0.23	867	<1.3	500	<4	<1
RI-450	7.11	0.22	0.44	0.29	20.28	256	<0.1	5.8	<5	205	<0.05	0.22	0.14	471	<1.25	260	<4	7.6
SA-BYRD	8.28	0.61	1.23	0.80	22.11	591	1	35	50	43.1	<0.05	1.44	0.21	1237	53.2	794	<4	1
UN-167	5.28	0.07	0.15	0.10	19.25	6.3	<0.1	13.2	<5	40	7.48	<0.1	<0.05	163	12	128	5.3	7.7
W-192	8.80	0.44	0.88	0.57	19.60	335	0.6	66.6	21	<5	<0.05	0.72	0.38	907	36.3	551	<4	1.3
W-198	8.49	0.18	0.38	0.24	21.96	200	0.23	11	50	<5	<0.05	0.23	1.74	399	<1.3	260	<4	<1
WC-187	7.13	0.54	1.08	0.70	18.73	313	0.2	166	<5	432	0.07	0.3	0.09	1095	16.9	598	<4	4.2
WC-187	7.17	0.53	1.05	0.68	18.96	324	0.14	169	<5	423	0.08	0.19	0.12	1124	12.7	598	<4	4.8
WC-487	7.51	0.47	0.94	0.61	20.24	365	<0.1	100	<5	58.4	0.14	0.3	0.12	976	<1.3	558	<4	<1

* Denotes duplicate sample. † Reported result is estimated. ‡ Result is reported from dilution.

Table 4.1.7.
Summary of inorganic (Total Metals) data.

WELL NAME	ANTIMONY PPB	ARSENIC PPB	BARIUM PPB	BERYLLIUM PPB	CADMIUM PPB	CHROMIUM PPB	COPPER PPB	IRON PPB	LEAD PPB	MERCURY PPB	NICKEL PPB	SELENIUM PPB	SILVER PPB	THALLIUM PPB	ZINC PPB
LABORATORY DETECTION LIMITS	1/5/10	3/10	1	1	0.5/1	3/5	3/10	20	3/10	0.05	3/5	4/5	0.5/10	1/5	10/20
Carrizo-Wilcox Aquifer															
BI-236	<1	<3	10.4	<1	<0.5	<3	<3	<20	<3	<0.05	<3	<4	<0.5	<1	<10
BO-274	<1	<3	6.5	<1	<0.5	<3	<3	300	<3	<0.05	<3	<4	<0.5	<1	17.5
BO-275	<1	<3	285	<1	<0.5	<3	4.1	355	<3	<0.05	<3	<4	<0.5	<1	107
CD-453	<1	<3	39	<1	<0.5	<3	<3	34.3	<3	<0.05	<3	<4	<0.5	<1	<10
CD-630	<1	<3	164	<1	<0.5	<3	<3	551	<3	<0.05	<3	<4	<0.5	<1	43.8
CD-639	<1	<3	37.1	<1	<0.5	<3	<3	38.5	<3	<0.05	<3	<4	<0.5	<1	<10
CD-642	<1	<3	21.8	<1	<0.5	<3	<3	<20	<3	<0.05	<3	<4	<0.5	<1	<10
CD-642*	<1	<3	21.3	<1	<0.5	<3	<3	<20	<3	<0.05	<3	<4	<0.5	<1	<10
DS-363	<1	<3	8	<1	<0.5	<3	5.1	33.1	<3	<0.05	<3	<4	<0.5	<1	10.8
DS-5996Z	<1	<3	36.9	<1	<0.5	<3	<3	24.7	<3	<0.05	<3	<4	<0.5	<1	<10
RR-5070Z	<1	<3	194	<1	<0.5	<3	14	184	<3	<0.05	4.9	<4	<0.5	<1	49.4
SA-502	<1	<3	17.8	<1	<0.5	<3	<3	36.6	<3	<0.05	<3	<4	<0.5	<1	<10
Sparta Aquifer															
BI-192	<1	<3	23.7	<1	<0.5	<3	<3	169	<3	<0.05	<3	<4	<0.5	<1	15
BI-212	<1	<3	74	<1	<0.5	<3	<3	2170	<3	<0.05	<3	<4	<0.5	<1	<10
CA-105	<1	<3	16	<1	<0.5		<3	37.9	<3	<0.05	<3	<4	<0.5	<1	10.4
CL-203	<1	<3	70.7	<1	<0.5		4.8	1380	<3	<0.05	<3	<4	<0.5	<1	<10
CL-203*	<1	<3	71.2	<1	<0.5		<3	1380	<3	<0.05	<3	<4	<0.5	<1	<10
L-31	†<5	†<15	10	<1	†<2		15	43.1	†<15	<0.05	†<15	†<20	†<2	†<5	†<50
L-32	<1	<3	3.1	<1	<0.5	Not reported from Lab	<3	24.6	<3	<0.05	<3	<4	<0.5	<1	<10
MO-253	<1	<3	23.7	<1	<0.5		<3	51.6	<3	<0.05	<3	<4	<0.5	<1	<10
MO-253*	<1	<3	23.8	<1	<0.5		<3	54.9	<3	<0.05	<3	<4	<0.5	<1	22.7
OU-506	<1	<3	7.7	<1	<0.5		<3	21.9	<3	<0.05	<3	<4	<0.5	<1	<10
OU-597	<1	<3	58.5	<1	<0.5		3.2	<20	<3	<0.05	<3	<4	<0.5	<1	<10
SA-534	<1	<3	80.1	<1	<0.5		<3	1490	<3	<0.05	<3	<4	<0.5	<1	<10
UN-205	<1	<3	38.2	<1	<0.5	<3	8.6	29.3	<3	<0.05	<3	<4	<0.5	<1	<10
UN-205*	<1	<3	38.2	<1	<0.5	<3	<3	<20	<3	<0.05	<3	<4	<0.5	<1	<10

WELL NAME	ANTIMONY PPB	ARSENIC PPB	BARIUM PPB	BERYLLIUM PPB	CADMIUM PPB	CHROMIUM PPB	COPPER PPB	IRON PPB	LEAD PPB	MERCURY PPB	NICKEL PPB	SELENIUM PPB	SILVER PPB	THALLIUM PPB	ZINC PPB
LABORATORY DETECTION LIMITS	1/5/10	3/10	1	1	0.5/1	3/5	3/10	20	3/10	0.05	3/5	4/5	0.5/10	1/5	10/20
W-165	<1	<3	15.4	<1	<0.5	<3	5.7	27	<3	<0.05	<3	<4	<0.5	<1	<10
WB-241	<1	<3	99.7	<1	<0.5	<3	4.9	63	<3	<0.05	<3	<4	<0.5	<1	<10
WB-269	<1	<3	106	<1	<0.5	<3	8.1	<20	3.9	0.1	5.8	<4	<0.5	<1	25.7
Cockfield Aquifer															
CA-35	<10	<10	151	<1	<1	<5	<10	6600	<10	<0.05	<5	<5	<10	<5	<20
EC-233	<10	<10	429	<1	<1	<5	<10	635	<10	<0.05	<5	<5	<10	<5	<20
MO-479	<10	<10	357	<1	<1	<5	<10	2150	<10	<0.05	<5	<5	<10	<5	<20
MO-479*	<10	<10	367	<1	<1	<5	<10	2200	<10	<0.05	<5	<5	<10	<5	<20
NA-5614Z	<10	<10	35.7	<1	<1	<5	17.5	395	<10	<0.05	<5	<5	<10	<5	<20
OU-FRITH	<10	<10	119	<1	<1	<5	40	108	<10	<0.05	<5	<5	<10	<5	<20
OU-FRITH*	<10	<10	129	<1	<1	<5	<10	88.3	<10	<0.05	<5	<5	<10	<5	<20
RI-127	<10	<10	37.4	<1	<1	<5	<10	42.3	<10	<0.05	<5	<5	<10	<5	<20
RI-450	<10	<10	170	<1	<1	<5	<10	789	<10	<0.05	<5	<5	<10	<5	<20
SA-BYRD	<10	<10	65.9	<1	<1	<5	<10	65.1	<10	<0.05	<5	<5	<10	<5	<20
UN-167	<10	<10	398	<1	<1	<5	<10	2830	<10	0.1	<5	<5	<10	<5	<20
W-192	<10	<10	13.5	<1	<1	<5	13.4	24.1	<10	<0.05	<5	<5	<10	<5	<20
W-198	<10	<10	6.1	<1	<1	<5	<10	78.3	<10	<0.05	<5	<5	<10	<5	<20
WC-187	<10	<10	186	<1	<1	<5	<10	593	<10	<0.05	<5	<5	<10	<5	<20
WC-487	<10	<10	108	<1	<1	<5	<10	171	<10	0.23	<5	<5	<10	<5	<20

* Denotes duplicate sample. † Detection limits increased due to matrix interference.

Table 4.1.8.
Conventional parameters statistics by aquifer.

	PH SU	SAL. PPT	SP. COND. MMHOS/CM	TDS G/L	TEMP DEG. C	ALK. PPM	NH3 PPM	CL PPM	COLOR PCU	HARD PPM	NITRITE-NITRATE (AS N) PPM	TKN PPM	TOT. P PPM	SP. COND. UMHOS/CM	SO4 PPM	TDS PPM	TSS PPM	TURB NTU
	FIELD PARAMETERS					LABORATORY PARAMETERS												
Carrizo-Wilcox Aquifer																		
Minimum	6.61	0.14	0.296	0.19	20.64	26.8	<0.1	17.7	<5	<5	<0.05	0.3	<0.05	199	<1.25	112	<4	<1
Maximum	8.90	0.62	1.233	0.80	26.94	626	1.3	181	24	118	0.51	1.33	0.96	1,212	71.70	702	5	6
Average	8.31	0.36	0.735	0.48	21.83	283.4	0.64	66.4	8.2	37.9	0.10	0.75	0.28	739	13.10	429.7	<4	1.9
Sparta Aquifer																		
Minimum	6.48	0.07	0.145	0.094	20.20	3.2	<0.1	1.8	<5	<5	<0.05	<0.1	<0.05	26.1	<1.25	29	<4	<1
Maximum	9.03	1.04	2.034	1.322	25.75	5.82	0.95	108	60	32.4	1.21	1.16	0.78	2,040	19.9	1,112	<4	1.5
Average	8.02	0.44	0.890	0.580	23.78	202.6	0.48	24.8	14.6	13.7	0.17	0.54	0.29	795	6.1	461	<4	<1
Cockfield Aquifer																		
Minimum	5.28	0.07	0.15	0.1	17.09	6.3	<0.1	2.7	<5	<5	<0.05	<0.1	<0.05	163	<1.25	128	<4	<1
Maximum	8.80	0.61	1.23	0.8	22.11	591	1.0	169	50	432	7.48	1.44	1.74	1,237	149	794	5.3	25
Average	7.46	0.35	0.70	0.46	19.82	293.7	0.36	52.5	11	140	0.50	0.47	0.30	737	21.88	438	<4	5.44

Table 4.1.9.
Inorganic parameters statistics by aquifer.

	ANTIMONY PPB	ARSENIC PPB	BARIUM PPB	BERYLLIUM PPB	CADMIUM PPB	CHROMIUM PPB	COPPER PPB	IRON PPB	LEAD PPB	MERCURY PPB	NICKEL PPB	SELENIUM PPB	SILVER PPB	THALLIUM PPB	ZINC PPB
Carrizo-Wilcox Aquifer															
Minimum	<1	<3	6.5	<1	<0.5	<3	<3	<20	<3	<0.05	<3	<4	<0.5	<1	<10
Maximum	<1	<3	285	<1	<0.5	<3	14	551	<3	<0.05	4.9	<4	<0.5	<1	107
Average	<1	<3	170.2	<1	<0.5	<3	3.06	132.3	<3	<0.05	<3	<4	<0.5	<1	22
Sparta Aquifer															
Minimum	<1	<3	3.1	<1	<0.5	<3	<3	<20	<3	<0.05	<3	<4	<0.5	<1	<10
Maximum	<1	<3	106	<1	<0.5	<3	8.6	2,170	3.9	0.1	5.8	<4	<0.5	<1	25.7
Average	<1	<3	44.7	<1	<0.5	<3	3.1	410.1	<3	<0.05	<3	<4	<0.5	<1	<10
Cockfield Aquifer															
Minimum	<10	<10	6.1	<1	<1	<5	<10	24.1	<10	<0.05	<5	<5	<10	<5	<20
Maximum	<10	<10	429	<1	<1	<5	40	6,600	<10	0.23	<5	<5	<10	<5	<20
Average	<10	<10	161.8	<1	<1	<5	8.34	1,084.1	<10	<0.05	<5	<5	<10	<5	<20

Table 4.1.10.
List of VOC analytical parameters.

COMPOUND	ANALYTICAL METHOD	CAS NUMBER	PQL (ppb)
1,1-Dichloroethane	624	75343	2
1,1-Dichloroethene	624	75354	2
1,1,1-Trichloroethane	624	71556	2
1,1,2-Trichloroethane	624	79005	2
1,1,2,2-Tetrachloroethane	624	79345	2
1,2-Dichlorobenzene	624	95501	2
1,2-Dichloroethane	624	107062	2
1,2-Dichloropropane	624	78875	2
1,3-Dichlorobenzene	624	541731	2
1,4-Dichlorobenzene	624	106467	2
Benzene	624	71432	2
Bromoform	624	75252	2
Carbon Tetrachloride	624	56235	2
Chlorobenzene	624	108907	2
Dibromochloromethane	624	124481	2
Chloroethane	624	75003	2
cis-1,3-Dichloropropene	624	10061015	2
Bromodichloromethane	624	75274	2
Methylene Chloride	624	75092	2
Ethyl Benzene	624	100414	2
Methyl Bromide	624	74839	2
Methyl Chloride	624	74873	2
Methylene Chloride	624	75092	2
o-Xylene	624	95476	2
Styrene	624	100425	2
Methyl-t-Butyl Ether	624	1634044	2
Tetrachloroethylene	624	127184	2
Toluene	624	108883	2
trans-1,2-Dichroloethene	624	156605	2
trans-1,3-Dichloropropene	624	10061026	2
Trichloroethylene	624	79016	2
Trichlorofluoromethane	624	75694	2
Chloroform	624	67663	2
Vinyl Chloride	624	75014	2

PQL = Practical Quantitation Limit
ppb = parts per billion

Table 4.1.11.
List of semi-volatile analytical parameters.

COMPOUND	ANALYTICAL METHOD	CAS NUMBER	PQL (ppb)
1,2-Dichlorobenzene	625	95501	10
1,2,3-Trichlorobenzene	625	87616	10
1,2,3,4-Tetrachlorobenzene	625	634662	10
1,2,4-Trichlorobenzene	625	120821	10
1,2,4,5-Tetrachlorobenzene	625	95943	10
1,3-Dichlorobenzene	625	541731	10
1,3,5-Trichlorobenzene	625	108703	10
1,4-Dichlorobenzene	625	106467	10
2-Chloronaphthalene	625	91587	10
2-Chlorophenol	625	95578	20
2-Methyl-4,6-dinitrophenol	625	534521	20
2-Nitrophenol	625	88755	20
2,4-Dichlorophenol	625	120832	20
2,4-Dimethylphenol	625	105679	20
2,4-Dinitrophenol	625	51285	20
2,4-Dinitrotoluene	625	121142	10
2,4,6-Trichlorophenol	625	88062	20
2,6-Dinitrotoluene	625	606202	10
3,3'-Dichlorobenzidine	625	91941	20
4-Bromophenyl phenyl ether	625	101553	10
4-Chloro-3-methylphenol	625	59507	20
4-Chlorophenyl phenyl ether	625	7005723	10
4-Nitrophenol	625	100027	20
Acenaphthene	625	83329	10
Acenaphthylene	625	208968	10
Anthracene	625	120127	10
Benzidine	625	92875	20
Benzo[a]pyrene	625	50328	10
Benzo[k]fluoranthene	625	207089	10
Benz[a]anthracene	625	56553	10
Benzo[b]fluoranthene	625	205992	10
Benzo[g,h,i]perylene	625	191242	10
bis (2-Chloroethoxy) methane	625	111911	10
bis (2-Ethylhexyl) phthalate	625	117817	10
bis (2-Chloroethyl) ether	625	111444	10
bis (2-Chloroisopropyl) ether	625	108601	10
Butyl benzyl phthalate	625	85687	10
Chrysene	625	218019	10
Diethyl phthalate	625	84662	10
Dimethyl phthalate	625	131113	10
Di-n-butyl phthalate	625	84742	10

COMPOUND	ANALYTICAL METHOD	CAS NUMBER	PQL (ppb)
Di-n-octyl phthalate	625	117840	10
Fluoranthene	625	206440	10
Fluorene	625	86737	10
Hexachlorobenzene	625	118741	10
Hexachlorobutadiene	625	87683	10
Hexachloroethane	625	67721	10
Indeno[1,2,3-cd]pyrene	625	193395	10
Isophorone	625	78591	10
Naphthalene	625	91203	10
Nitrobenzene	625	98953	10
n-Nitroso-di-n-propylamine	625	621647	10
Pentachlorophenol	625	87865	50
Phenanthrene	625	85018	10
Phenol	625	108952	10
Pyrene	625	129000	10

Table 4.1.12.
List of pesticide and PCB analytical parameters.

COMPOUND	ANALYTICAL METHOD	CAS NUMBER	PQL (ppb)
4,4'-DDD	625	72548	2
4,4'-DDE	625	72559	2
4,4'-DDT	625	50293	2
Aldrin	625	309002	2
alpha-BHC	625	319846	2
beta-BHC	625	319857	2
delta-BHC	625	319868	2
gamma-BHC	625	58899	2
Chlordane	625	57749	2
Dieldrin	625	60571	2
Endosulfan I	625	959988	2
Endosulfan II	625	33213659	2
Endosulfan Sulfate	625	1031078	2
Endrin	625	72208	2
Endrin Aldehyde	625	7421934	2
Heptachlor	625	76448	2
Heptachlor Epoxide	625	1024573	2
Toxaphene	625	8001352	75
Aroclor-1016	625	12674112	10
Aroclor-1221	625	11104282	10
Aroclor-1232	625	11141165	10
Aroclor-1242	625	53469219	10
Aroclor-1248	625	12672296	10
Aroclor-1254	625	11097691	10
Aroclor-1260	625	11096825	10

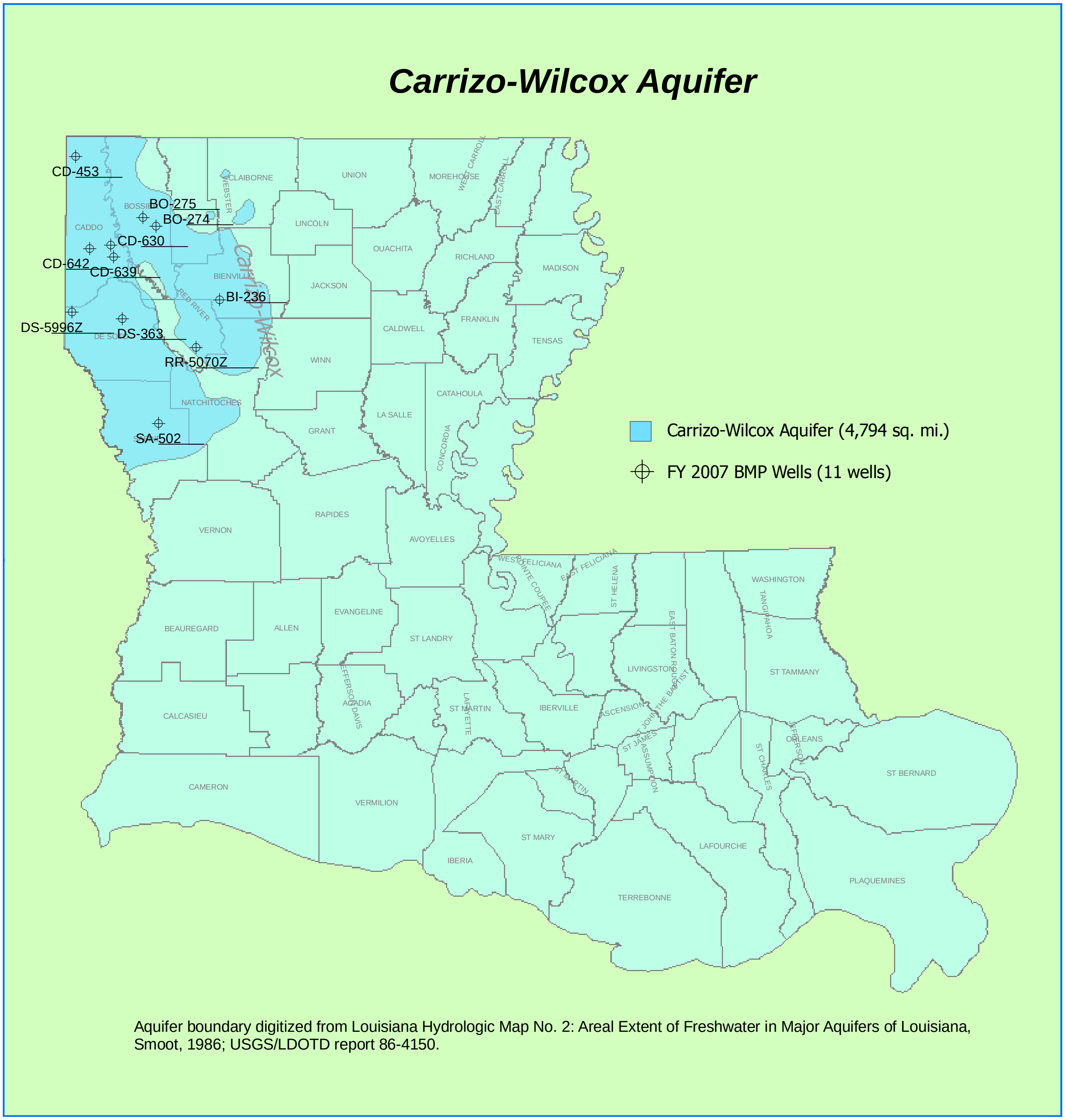

Figure 4.1.1 Map of Carrizo-Wilcox Aquifer and associated Baseline Monitoring Program wells.

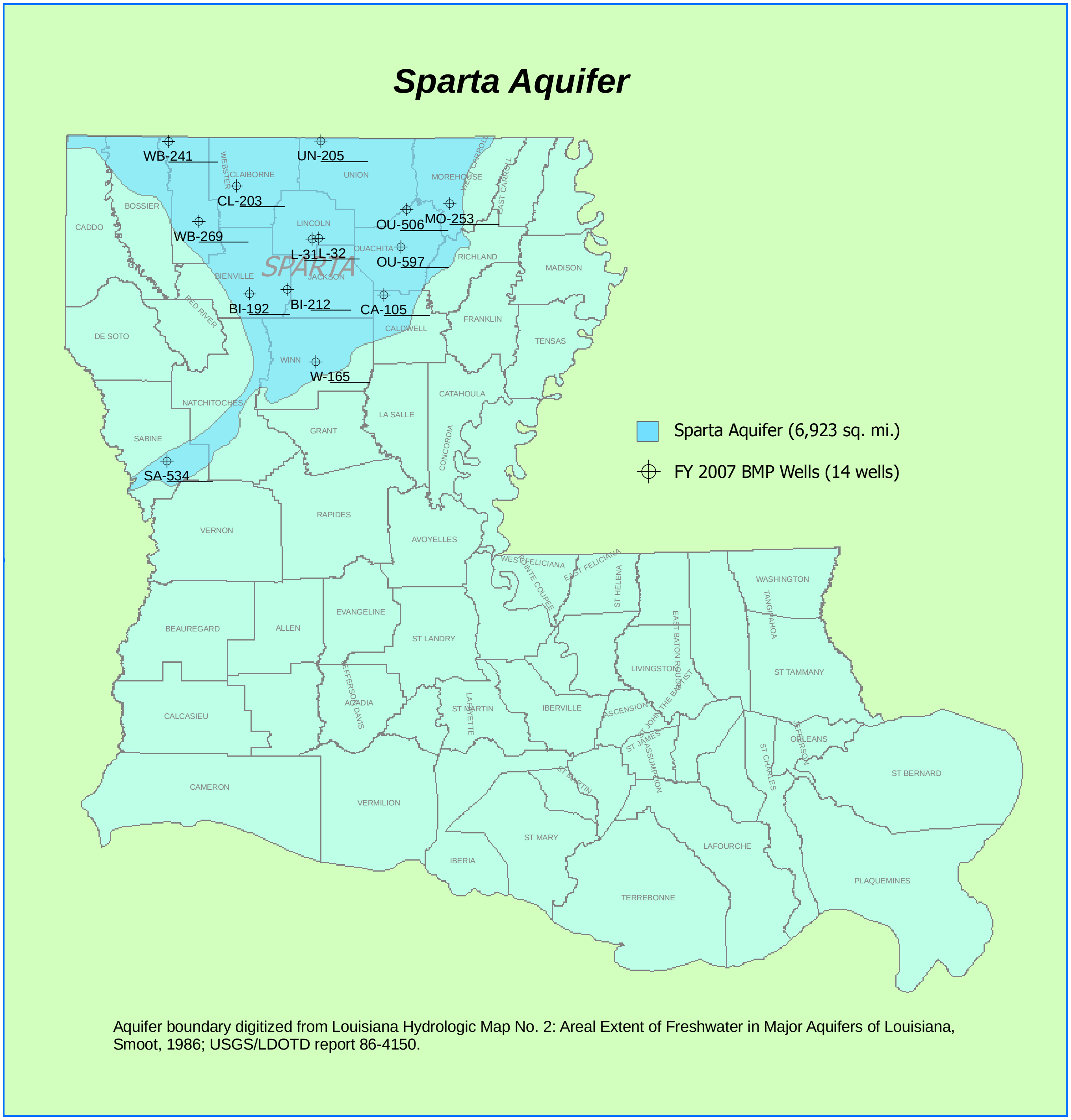

Figure 4.1.2 Map of Sparta Aquifer and associated Baseline Monitoring Program wells.

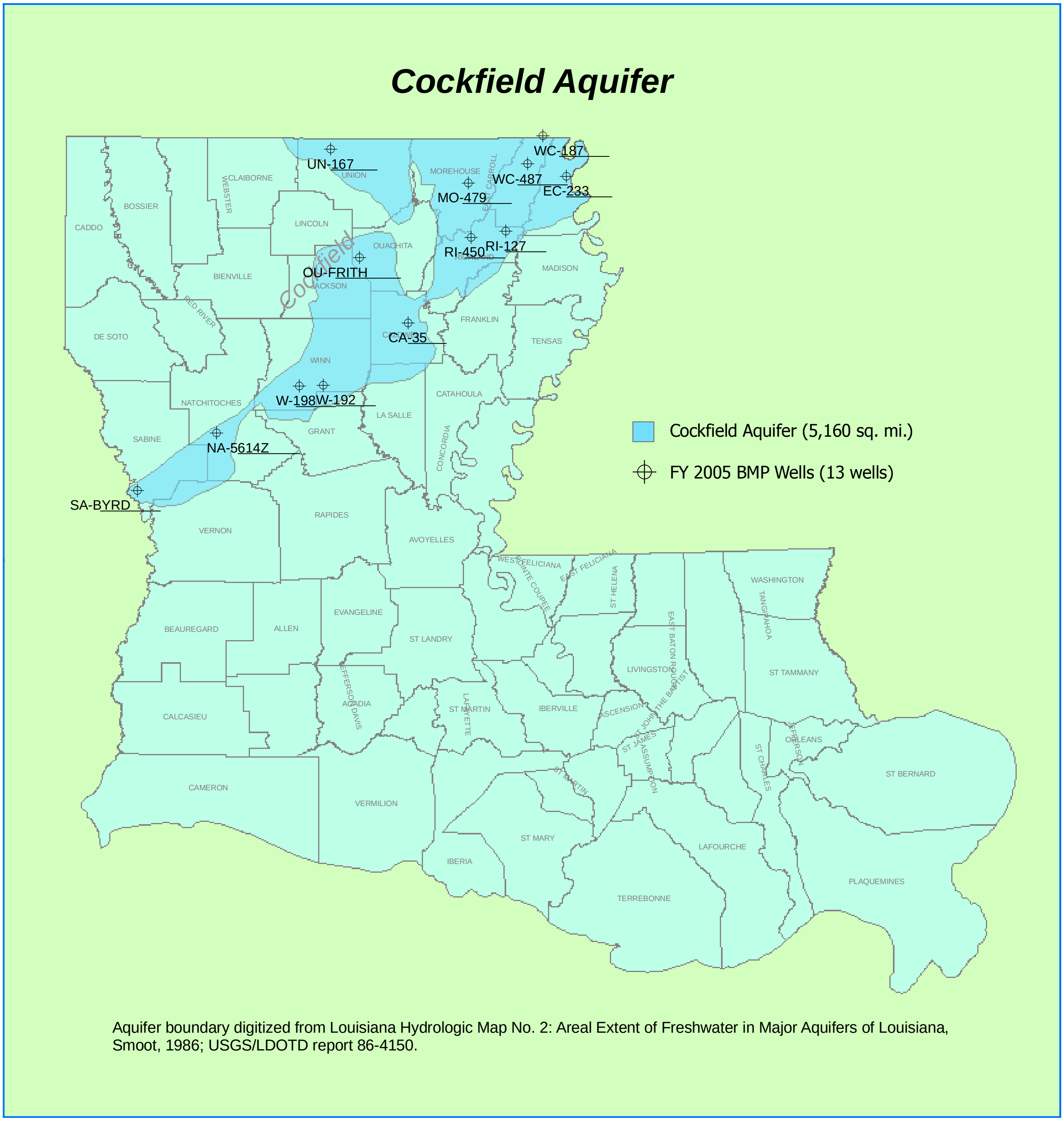

Figure 4.1.3 Map of Cockfield Aquifer and associated Baseline Monitoring Program wells.

GLOSSARY

Agriculture – Agriculture involves the use of water for crop spraying, irrigation, livestock watering, poultry operations and other farm purposes not related to human consumption.

Clean technique metals analysis – an integrated system of sample collection and laboratory analytical procedures designed to detect concentrations of trace metals below criteria levels and eliminate or minimize inadvertent sample contamination that can occur during traditional sampling practices.

Degree of support – The level at which water quality supports the designated uses of a water body specified in the Louisiana Water Quality Standards. The degree of support is divided into three levels: fully supporting uses, partially supporting uses, and not supporting uses.

Designated water use – A use of the waters of the state as established by the Louisiana Water Quality Standards. These uses include, but are not limited to, recreation, propagation of fish and other aquatic life and wildlife, including oysters, public water supply, agricultural activities and outstanding natural resource waters.

Dissolved oxygen – The amount of oxygen dissolved in water, commonly expressed as a concentration in terms of milligrams per liter, mg/l.

Drinking water supply – A surface or underground raw water source which, after conventional treatment, will provide safe, clear, potable and aesthetically pleasing water for uses which include but are not limited to, human consumption, food processing and cooking, and as a liquid ingredient in foods and beverages.

Effluent – Wastewater discharged to waters of the state.

Effluent limitation – Any applicable state or federal quality or quantity limitation, which imposes any restriction or prohibition on quantities, discharge rates and concentrations of pollutants which are discharged into waters of the state.

Effluent limited segment – Any stream segment where water quality is meeting and will continue to meet applicable water quality standards or where there is adequate demonstration that water quality will meet applicable standards after the application of effluent limitations required by the Clean Water Act, as amended.

Evaluated waters – Water bodies for which assessment is based on information other than current site-specific ambient data, such as data on land use, location of pollutant sources, fisheries surveys, fish kill investigations, spill investigations and citizen complaints.

Fecal coliform – Gram negative, non-spore forming, rod-shaped bacteria found in the intestinal tracts of warm-blooded animals.

Fish and wildlife propagation – Fish and wildlife propagation includes the use of water for preservation and reproduction of aquatic biota such as indigenous species of fish and invertebrates, as well as reptiles, amphibians, and other wildlife associated with the aquatic environment. This use also includes the maintenance of water quality at a level that prevents contamination of aquatic biota consumed by humans.

Limited Aquatic Life and Wildlife – A subcategory of fish and wildlife propagation that recognizes not all water bodies are capable of supporting the same level of species diversity and richness. Examples of water bodies to which this may be applied include intermittent streams and man-made water bodies that lack suitable riparian structure and habitat.

Monitored waters – Water bodies for which assessment is based on current site-specific ambient data.

Naturally dystrophic waters – Waters which are stained with organic material and which are low in dissolved oxygen due to natural conditions.

Nonpoint source – A diffuse source of water pollution that does not discharge through a point source or pipe, but instead flows freely across exposed natural or man-made surfaces, such as plowed fields, pasture land, construction sites and parking lots.

Outstanding natural resource waters – Outstanding and natural resource waters include water bodies designated for preservation, protection, reclamation, or enhancement of wilderness and aesthetic qualities and ecological regimes, such as those designated under the Louisiana Natural and Scenic Rivers System or those designated by the Office of Environmental Assessment as waters of ecological significance. This use designation applies only to the water bodies specifically identified in Louisiana's numerical criteria, LAC 33:IX.1123, table 3, and not to their tributaries or distributaries, unless so specified.

Oxygen demanding substances – Organic matter or materials in water or wastewater which utilize oxygen during the decomposition process, and inorganic material, such as sulfides, which utilize oxygen during the oxidation process.

Oyster propagation – The use of water to maintain biological systems that support economically important species of oysters, clams, mussels, or other mollusks so that their productivity is preserved and the health of human consumers of these species is protected. This use shall apply only to those water bodies named in the numerical criteria tables and not to their tributaries or distributaries unless so specified.

Point source – A discernible, confined and discrete conveyance including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

Potentiometric surface – An imaginary surface representing the total head of ground water in a confined aquifer that is defined by the level to which water will rise in a well.

Primary contact recreation – Any recreational activity which involves or requires prolonged body contact with the water, such as swimming, water skiing, tubing, snorkeling and skin-diving.

Riparian – Area of land along the banks of a stream which often exhibits slightly different vegetation and habitats than the surrounding landscape. Because of this variation, riparian areas are considered valuable wildlife habitat and important for the protection of water quality.

Subsegment – A named regulatory water body as defined by LAC 33:IX.1123. They are considered representative of the watershed through which they flow and, therefore, have numerical criteria assigned to them. This is the level of watersheds at which §305(b) assessments are applied. Each subsegment has a six digit number assigned in the following manner, 03=basin, 01=segment, 01=subsegment. This would be read as 030101, which represents Calcasieu River-headwaters to Highway 8. For mapping purposes the subsegment is defined as a polygonal geographical area using GIS (Geographic Information System).

Secondary contact recreation – Any recreational activity which may involve incidental or accidental body contact with the water and during which the probability of ingesting appreciable quantities of water is minimal, such as fishing, wading and recreational boating.

Toxic substances – Any element, compound or mixture which at sufficient exposure levels induces deleterious acute or chronic physiological effects on an organism.

Wastewater – Liquid waste resulting from commercial, municipal, private or industrial processes. This includes but is not limited to, cooling and condensing waters, sanitary sewage, industrial waste and contaminated rainwater runoff.

Water body – Any contiguous body of water identified by the state. A water body can be a stream, a river, a segment of a stream or river, a lake, a bay, a series of bays, or a watershed.

Water quality limited segment – Any stream segment where the stream does not meet applicable water quality standards or will not meet applicable water quality standards even after application of the effluent limitations required by the Clean Water Act, as amended.

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APPENDIX A: 2008 Integrated Report of Water Quality in Louisiana

Appendix A is taken from Louisiana's 2008 Assessment Database (ADB), which contains all water quality assessments for the state. All suspected causes of impairment and suspected sources of impairment are linked in a one to one fashion, meaning, a given suspected cause of impairment is believed to be affected by the suspected source of impairment provided on the same line of the table. However, as a result of this linking, some suspected causes and or sources may be listed more than once for a given water body subsegment. This results in cases where a suspected cause of impairment has two or more suspected sources of impairment. Likewise, if a suspected source of impairment affects two or more suspected causes of impairment, the suspected source will be listed more than once. This is important to note in order to prevent double counting when attempting to develop subtotals for the size or number of water bodies affected by a given suspected cause or suspected source of impairment.

The full water quality assessment table is contained in Appendix A at: 08_IR1-FINAL-Appendix A-All Assessments.

Assessment Table Header Information

Type = water body type:
R = river
L = lake
E = estuary
W = wetland.

Designated Uses and Codes:
PCR = primary contact recreation (swimming)
SCR = secondary contact recreation (boating)
FWP = fish and wildlife propagation
DWS = drinking water supply
ONR = outstanding natural resources
AGR = agriculture
OYS = oyster propagation
LAL = limited aquatic life and wildlife

IR Category and TMDL Codes:
IR Category for Suspected Causes = Integrated Report Category. See Part III, Chapter 2 for details of these categories.
TMDL Due Date = year in which TMDL is due according to U.S. EPA's Consent Decree schedule or LDEQ schedules beyond the Consent Decree for newly listed water body subsegments.
TMDL Priority = priority order in which TMDLs will be developed, based on U.S. EPA's Consent Decree schedule and addition of newly listed water body subsegments.

Designated Use Support Statements

Designated uses are assessed as either fully supporting or not supporting the use based on water quality assessment procedures described in Part III, Chapter 2 of this report. In some cases insufficient data or no data are available with which to make an assessment. Where a designated use exists for a water body subsegment, letters are used in that column to indicate the 2008 assessment of that use. These letters are defined as follows:

F = Fully supporting the designated use
N = Not supporting the designated use
I = Insufficient data to make an assessment
X = No data with which to make an assessment

Descriptions of Louisiana's Watershed Basins

For water quality management purposes, Louisiana is divided into twelve large-scale watershed basins. These basins are based on eleven river watersheds plus the Lake Pontchartrain watershed. Also for management purposes, these basins were assigned numbers for use in watershed segment and subsegment delineation. These subsegments are described in more detail in Part II, Chapter 2 of this report. The twelve basins and their associated numbers are:

Atchafalaya River Basin (01)
Barataria Basin (02)
Calcasieu River Basin (03)
Lake Pontchartrain Basin (04)
Mermentau River Basin (05)
Vermilion-Teche Basin (06)
Mississippi River Basin (07)
Ouachita River Basin (08)
Pearl River Basin (09)
Red River Basin (10)
Sabine River Basin (11)
Terrebonne Basin (12)

Descriptions of each of these twelve basins follow:

ATCHAFALAYA RIVER BASIN (01)

The Atchafalaya River Basin is located in the south central part of Louisiana. The Atchafalaya River is a distributary of the Red, Black, and Mississippi Rivers, presently carrying about 30 percent of the Mississippi's flow. The basin is well-defined by a system of levees, which surround it on the north, east, and west. The entire basin serves as a major floodway for Mississippi River floodwaters. It encompasses approximately 1,806 square miles. The Atchafalaya Basin is predominantly wooded lowland and cypress-tupelo swamp with some fresh water marshes in the lower distributary area. It constitutes the largest contiguous fresh water swamp in the United States.

BARATARIA BASIN (02)

The Barataria Basin lies in the eastern coastal region of the state. This basin is bounded on the north and east by the lower Mississippi River, on the west by Bayou Lafourche, and on the south by the Gulf of Mexico. The major receiving water body in this basin is Barataria Bay. The Barataria Basin consists largely of wooded lowlands and fresh to brackish marshes, having some saline marsh on the fringes of Barataria Bay. Elevations in this basin range from minus two feet to four feet above sea level.

CALCASIEU RIVER BASIN (03)

The Calcasieu River Basin is located in southwestern Louisiana and is positioned in a north-south direction. The drainage area of the Calcasieu Basin comprises approximately 3,910 square miles. Headwaters of the Calcasieu River are in the hills west of Alexandria. The river flows south for about 160 miles to the Gulf of Mexico. The mouth of the river is about 30 miles east of the Texas-Louisiana state line. The landscape in this basin varies from pine-forested hills in the upper end to brackish and salt marshes in the lower reach around Calcasieu Lake.

LAKE PONTCHARTRAIN BASIN (04)

The Lake Pontchartrain Basin, located in southeastern Louisiana, consists of the tributaries and distributaries of Lake Pontchartrain, a large estuarine lake. The basin is bounded on the north by the Mississippi state line, on the west and south by the east bank Mississippi River levee, on the east by the Pearl River Basin, and on the southeast by Breton and Chandeleur Sounds. This basin includes Lake Borgne, Breton Sound, Chandeleur Sound, and the Chandeleur Islands. The northern part of the basin consists of wooded uplands, both pine and hardwood forests. The southern portions of the basin consist of cypress-tupelo swamps and lowlands and brackish and saline marshes. The marshes of the southeastern part of the basin constitute the most rapidly eroding area along the Louisiana coast. Elevations in this basin range from minus five feet at New Orleans to over two hundred feet near the Mississippi border.

MERMENTAU RIVER BASIN (05)

The Mermentau River Basin is located in southwestern Louisiana and encompasses the prairie region of the state and a section of the coastal zone. The Mermentau River Basin is bounded on the north and east by the Vermilion-Teche Basin, on the west by the Calcasieu River Basin, and on the south by the Gulf of Mexico.

VERMILION-TECHE BASIN (06)

The Vermilion-Teche River Basin lies in south central Louisiana. The upper end of the basin lies in the central part of the state near Alexandria, and the basin extends southward to the Gulf of Mexico. The basin is bordered on the north and northeast by a low escarpment and the lower end of the Red River Basin. The Atchafalaya River Basin is to the east, and the Mermentau River Basin is to the west.

MISSISSIPPI RIVER BASIN (07)

The upper Mississippi River, which flows south, forms the boundary between Louisiana and Mississippi. The lower Mississippi River flows southeasterly through the southeast section of Louisiana. The upper stretch of the Mississippi does not get any tributary flow from the Louisiana side, which is leveed. Tributaries do enter from Mississippi, including the Yazoo River, the Black River, the Homochitto River, the Buffalo River and Bayou Pierre. The stretch of the Mississippi River between the Old River Control Structure and Baton Rouge does receive tributary flow from Thompson's Creek, Bayou Sara, Tunica Bayou, and Monte Sano Bayou. The river is leveed on both the east and west banks from Baton Rouge below Monte Sano Bayou to Venice. This stretch of the river is also heavily industrialized, receiving numerous industrial discharges from Baton Rouge to New Orleans. The birdfoot delta of the Mississippi, where it flows into the Gulf, consists of fresh and intermediate marshes.

OUACHITA RIVER BASIN (08)

The Ouachita River's source is found in the Ouachita Mountains of west central Arkansas near the Oklahoma border. The Ouachita River flows south through northeastern Louisiana and joins with the Tensas River to form the Black River, which empties into the Red River. The Ouachita Basin covers over 10,000 square miles of drainage area. Most of the basin consists of rich, alluvial plains cultivated in cotton and soybeans. The northwest corner of the basin is forested in pine, which is commercially harvested.

PEARL RIVER BASIN (09)

The Pearl River Basin lies along the southeastern Louisiana – southwestern Mississippi Border. This basin is bordered on the north by the Mississippi state line and on the west and south by the Lake Pontchartrain basin. Elevations in the basin range from 350 feet above mean sea level in the northwest portions to sea level at the southern end. Correspondingly, the vegetation varies from pine forests to brackish marsh.

RED RIVER BASIN (10)

The Red River has its origin in eastern New Mexico and flows across portions of Texas, Oklahoma and Arkansas before entering northwestern Louisiana. The river flows south to Shreveport, where it turns southeast and flows for approximately 160 miles to its junction with the Atchafalaya River. From the Arkansas state line to Alexandria, the Red River is contained within high banks, which range from 20 to 35 feet above low water level. Below Alexandria, the river flows through a flat alluvial plain, which is subject to backwater flooding during periods of high water. The Sabine River Basin lies to the southwest of the Red River Basin, and the Ouachita River Basin lies to the east. The Calcasieu, Vermilion-Teche, and Atchafalaya River Basins lie south of the Red River Basin. The Red River drains approximately 7,760 square miles within Louisiana.

SABINE RIVER BASIN (11)

The Sabine River Basin lies along the Texas-Louisiana border, encompassing more than 2,900 square miles of drainage area within Louisiana. The basin stretches from the Texas state line near Shreveport to the Gulf of Mexico. It is bounded on the east by the Red River Basin and Calcasieu River Basin. Characteristic vegetation ranges from mixed forests in the upper basin to hardwoods in the mid-section and brackish and saline marshes in the lower end.

TERREBONNE BASIN (12)

The Terrebonne Basin covers an area extending approximately 120 miles from the Mississippi River on the north to the Gulf of Mexico on the south. It varies in width from 18 miles to 70 miles. This basin is bounded on the west by the Atchafalaya River Basin and on the east by the Mississippi River and Bayou Lafourche. The topography of the entire basin is lowland, and all the land is subject to flooding except the natural levees along major waterways. The coastal portion of the basin is prone to tidal flooding and consists of marshes ranging from fresh to saline.

APPENDIX B: 2008 Integrated Report of Water Quality in Louisiana – Addendum

Appendix B contains 2008 Integrated Report information that could not be included in the original source Assessment Database (ADB). These items could not be included in ADB because they are "generic" listings of suspected impairments such as "pesticides" and "priority organics." These generic listings are a legacy of assessments known as evaluative assessments and are in most cases not based on chemical data. The Louisiana Department of Environmental Quality (LDEQ) is attempting to determine what specific chemicals were being considered when these generic evaluative assessment listings were originally made. As LDEQ determines what specific chemical was originally intended, that chemical will be included in the ADB. Likewise, if the specific chemical or class of chemicals originally intended is found to not be causing an impairment of water quality, the associated generic listing in this addendum will be removed.

The full addendum table is contained in Appendix B at: 08 IR1-FINAL-Appendix B-Addendum.

APPENDIX C: 2008 Integrated Report of Water Quality in Louisiana – Category 1 Addendum

Appendix C, the 2008 Integrated Report, Category 1 Addendum, contains those water body impairment combinations (WICs) that have been removed from USEPA's Consent Decree §303(d) List because the suspected cause is no longer considered to be impairing water quality of the water body subsegment. Removal may be based on more recent water quality data collected after development of the Consent Decree §303(d) List, or due to advances in water quality assessment that permit more accurate determinations of water quality. This information is included for Consent Decree List tracking purposes only and does not constitute a formal §303(d) or §305(b) submittal, nor is this Category 1 listing a requirement of the Clean Water Act.

The full Category 1 table is contained in Appendix C at: 08 IR1-FINAL-Appendix C-Category 1.

APPENDIX D: Complete list of suspected causes of impairment and cause descriptions used in USEPA's Assessment Database

The full list of suspected causes of impairment is contained in Appendix D at: 08 IR1-FINAL-Appendix D-Causes.

APPENDIX E: Complete list of suspected sources and source descriptions used in USEPA's Assessment Database

The full list of suspected sources of impairment table is contained in Appendix E at: 08 IR1-FINAL-Appendix E-Sources.

APPENDIX F: Complete Listing of Louisiana's Ambient Surface Water Quality Network Sites

The full list of ambient surface water quality network sites is contained in Appendix F at: 08 IR1-FINAL-Appendix F-Monitoring Sites. Not all sites contained in this list are currently sampled as part of LDEQ's rotating monitoring sites program.

APPENDIX G: Public Comments on the 2008 Integrated Report and LDEQ's Response to Comments

Appendix G is a compilation of all comments received regarding the 2008 Integrated Report, along with LDEQ's response to those comments. Any changes made to the 2008 Integrated Report based on public comments are noted in the column entitled, "Summary of LDEQ Responses." Also included in this response are changes made to the 2008 Integrated Report during the review period following public notice.

The full table of public comments and LDEQ's responses is contained in Appendix G at: 08 IR1-FINAL-Appendix G-Response to Comments.

APPENDIX H: LOUISIANA'S 2008 SECTION 303(D) LIST

Appendix H represents a subset of Louisiana's 2008 Integrated Report (IR) and includes only those water body impairment combinations (WICs) reported as Categories 5 or 5RC. As has been noted in the body of the IR text, WICs in Categories 5 and 5RC of the IR assessments are the only WICs on Louisiana's 2008 §303(d) List. This table was developed only as an aid to the public and does not constitute Louisiana's "official" §303(d) List. Every effort was made to maintain consistency between Appendix A Categories 5 and 5RC WICs and Appendix H. ***However, in order to ensure the accuracy of the overall Integrated Report, only those WICs in Appendix A, Categories 5 and 5RC, constitute the "official" §303(d) List.***

The full table of §303(d) Listed WICs, with the caveat noted above, is contained in Appendix H at: 08 IR1-FINAL-Appendix H-Cat 5 303d List.